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Iraqi Dental Association

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Rather than cursing the darkness, light a candle. From this old Chinese wisdom the Scientific committee along with Continuing education committee in the Iraqi Dental Association start re-lightening the old candles that been lightened 44 years ages but due to dark circumstances has been diminished.

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Finally, we promising to continue with our work, putting more and more efforts to meet the high standard of scientific global arena.

Table of content

Clinical Study of Sclerotherapy of Oral Vascular Malformations Using Absolute Per-Mucosal Ethanol Injection

Othman A. Omar
Department of Oral and Maxillofacial Surgery/College of Dentistry/Hawler Medical University
Omed I. Shihab
Department of Oral and Maxillofacial Surgery/College of Dentistry/Hawler Medical University
Hundren M. Ali
Department of Oral and Maxillofacial Surgery/College of Dentistry/Hawler Medical University

Abstract

Background and objectives: vascular malformations are a difficult entity to treat because they are often extensive and have a tendency to recur after treatment. This study aimed to assess the efficacy of permucosal sclerotherapy with use of absolute ethanol.

Methods: In a clinical prospective study all patients with oral vascular malformations, were enrolled sequentially in this study from Jan 2010-Jan 2012. The provisional diagnosis made upon accurate history and physical examination. Needle aspiration from the vascular malformation was also used for more confirmation. The ethanol was injected very slowly using single puncture with the needle moved in different directions within the lesion to distribute the ethanol throughout the lesion.
A descriptive statistical analysis was performed.

Results: A total of 18 patients (7 male and 11 female) with an age range of 13-38 years, and mean age of 23 years, were presented with vascular malformation and treated. Most of the patients cured by a single injection. One case cured with 4 times repeated injections.

Conclusion: Absolute ethanol injection was effective in the treatment of vascular malformations without complications.

Introduction

Congenital vascular anomalies have been and remain poorly understood. Since 1982 haemangiomas and vascular malformations have been recognised as distinct entities that exhibit unique characteristics and demand appropriately tailored treatment plans. However, "haemangioma" still continues to be used as a clinical and pathological description of many different types of vascular anomalies, which complicates both the care of patients and the interpretation of reports in journals.[1]

Vascular malformations are thought to be localized defects in vascular morphogenesis, usually caused by a dysfunction of embryogenesis and vasculogenesis regulator components.[2-6]

Over the years, a variety of techniques have been used in the treatment of VM, including irradiation, electrocoagulation, cryotherapy, laser therapy, copper implantation, surgical excision, and sclerotherapy.[7,8]

In the oral cavity, the lips, tongue, cheek mucosa, and palate are the main areas affected,9,10 leading to esthetic changes, pain, functional restrictions, ulceration, and bleeding, as well as dental asymmetry, impaired speech, and obstruction of the upper airways.[3,8,11]

Absolute alcohol, the most destructive and reliable sclerosant, is widely used in the treatment of vascular malformations because of its low cost, antiseptic quality, wide availability, and ease of use. [8,12,13]

The published data have reported local side effects, such as pain upon injection, partial or temporary scar, psychological tension, local edema and rash, and a risk of necrosis if sclerosis has been performed incorrectly.[6,10,14]

For smaller vascular lesions (≤30 mm), a single application of the sclerosis-inducing agent might suffice for total resolution.[15] The clinical appearance (soft mass, compressible, non pulsating, blue to bluish-red in colour), [6,9,11] in association with their evolutionary history, is essential to reach a diagnosis, and diascopy is an important tool in differentiating vascular from nonvascular lesions.[16] There have been attempts to use many sclerosants, including boiling water, sodium morrhuate, absolute ethanol, sodium tetradecyl sulfate, and bleomycin.7,8,17-20 This study aimed to assess the efficacy of permucosal sclerotherapy with use of absolute ethanol in the treatment of oral vascular malformations.

Methods:

In a clinical prospective study all patients with oral vascular malformations, (who referred to the Department of Oral and Maxillofacial Surgery/ Rizgree Teaching Hospital/ Erbil/ Iraq), were enrolled sequentially in this study from Jan 2010-Jan 2012. Patients with clinically evident oral soft tissue vascular malformations were included (bony lesions excluded). The size of the malformations included in this study ranged from 1cm-4cm. Each patient gave their consent to the treatment. The provisional diagnosis made upon accurate history (presence at birth, rapidity of proliferations, involution, and presence in adulthood),[21] and physical examination (soft mass, compressible, non pulsating, blue to bluish-red in colour).[6,9,11] Needle aspiration from the vascular malformation was also used for more confirmation.

Technique: All the procedures were done under local anesthesia. A disposable 5cc syringe was used for

injecting the absolute ethanol (96%). The amount of ethanol injected was about 1/4 of the vascular malformation size for each case. The ethanol was injected very slowly using single puncture with the needle moved in different directions within the lesion to distribute the ethanol throughout the lesion. Then the patients received dexamethasone 8mg (to prevent allergy and to reduce postoperative reaction) immediately after ethanol injection. Amoxicillin 500mg (1*3) and diclofenac 50mg (1*3) used for five days to reduce postoperative pain and swelling.

After 2 weeks the patients were seen and the tissue response (shape, volume, colour), local complications (ulcer, paralysis, and parasthesia) were evaluated. Patients with larger lesions received more than one injection in 2 weeks interval. The patients were followed up for at least 6 months. A descriptive statistics was used to analyze the data.

Results:

A total of 18 patients (7 male and 11 female) with an age range of 13-38 years, and mean age of 23 years, were presented with vascular malformation and treated. Table (1) shows the anatomic distribution of the vascular malformation in the oral cavity.

Most of the lesions (15 cases) were within the range of 0.5-2cm in diameter. Two lesions were about 3cm in diameter, and one (more than 4cm) diffused from buccal mucosa to the lip with obvious extraoral swelling. Fifteen cases (0.5-2cm range) were healed completely with single injection after 4 weeks. Two cases (3cm) were completely healed with 2 injections in 2 weeks interval. The final case healed with 4 injections in two weeks interval. The signs and symptoms noted after injection ranged in intensity

Table 1: Anatomic distribution

Site	No.	Percent
Upper Lip	2	11.11%
Lower lip	1	5.56%
Tongue	6	33.33%
Buccal mucosa	5	27.77%
Retromolar area	1	5.56%
Corner of the oral cavity	2	11.11%
Diffused	1	5.56%

From a local burning that lasted for up to 2 hours after injection to edema for up to 48 hours and reports of a hardening sensation of the lesion. No cases of paresthesia or paralysis in the areas affected by the sclerosis-inducing agent were found.

The mean follow up period was 8 months. No recurrent case was reported during the period of this study. No surgical interventions indicated in any case.

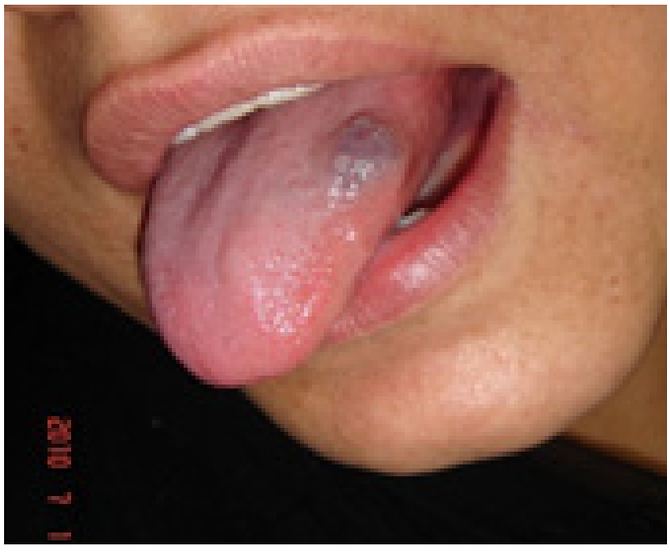

Figure 1: Vascular malformation on the lateral border of the tongue.

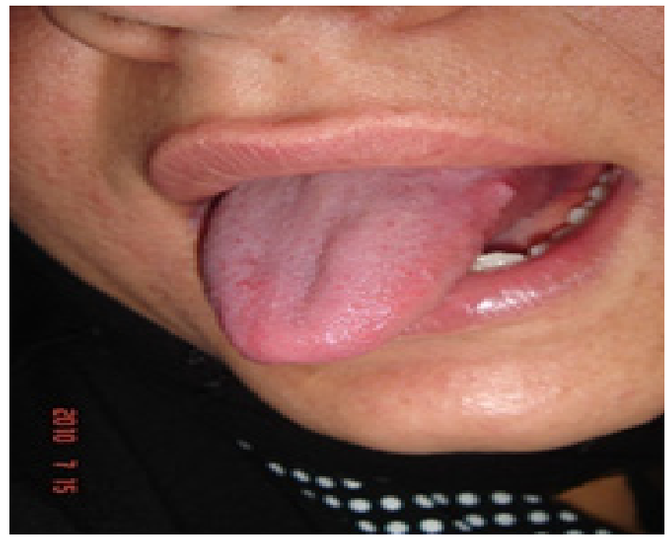

Figure 2: Two weeks after injection of the tongue showing resolution of the lesion

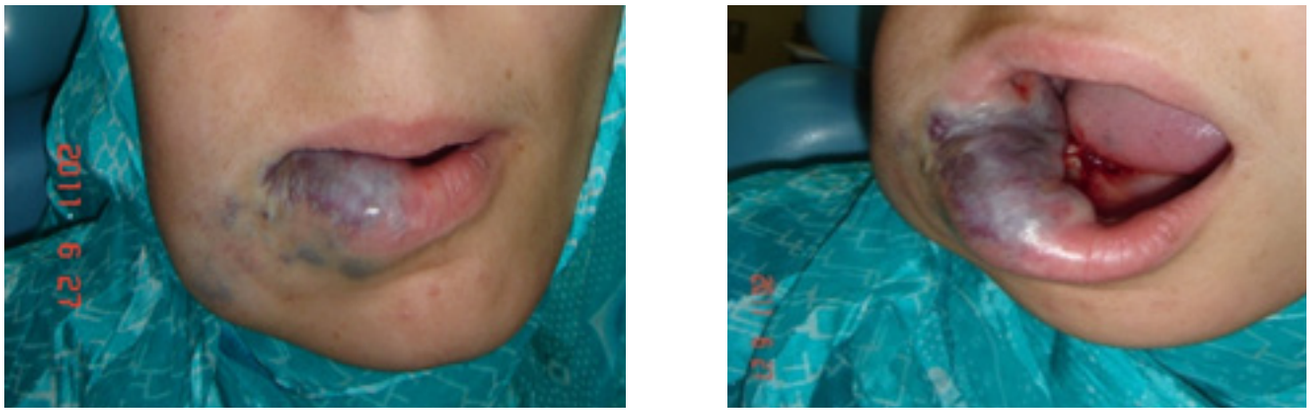

Figure 3: Diffused vascular malformation in a 23 years female patient.

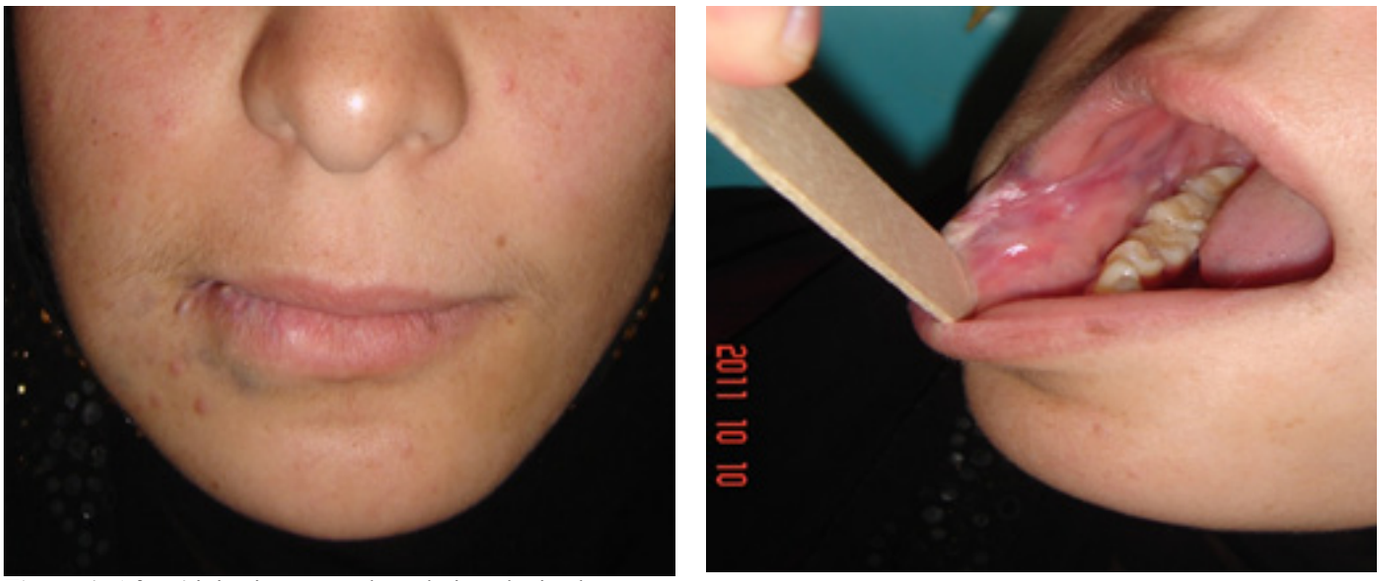

Figure 4: After 4 injections a good resolution obtained

Discussion:

Ethanol sclerosis is well tolerated, without systemic side effects, and is an effective adjunct to the management of vascular malformations. Advantages of ethanol injection include the ability to treat a very localized area without excision as well as the effective treatment of vascular malformations that recurred after operative removal. Conversely, extensive lesions may be palliated as symptoms occur.[22] Although the published data have mentioned sclerotherapy as the usual treatment of vascular malformations, the dose and mode of application of the sclerosis-inducing agent has not been standardized. In addition, a standardized definition of the dose of sclerosis- inducing agent has not been reported.

The only explanation has been an "amount compatible with the lesion size," which implies a high degree of subjectivity. Several studies have reported different protocols with varying degrees of the possibility of complications.[23,24] Potential complications of sclerotherapy include local skin necrosis, transient nerve palsy, haemoglobinuria, blood loss, and anaphylaxis.[25-28] The major disadvantage of this treatment is severe complication can rarely occur and include acute pulmonary hypertension with cardio-pulmonary collapse.[16] No such complications happened in our patients and this is may be due to the fact that slow injection and limited amount of ethanol could reduce the onset of these complications and this view had been supported by other authors.[28] Most of the cases were cured by a single injection and similar results were reported by other authors.[9,29,30,31] An inflammatory response, expressed by painful symptoms and/or low-intensity edema, characterizes the most commonly reported finding, although present for only a brief period. [10,30,32,33] Some authors[34, 35] reported that the intensity and occurrence of complications depended on the quality and quantity of the sclerosis-inducing agent used, the size of the lesion, and the professional's experience. The results of this study showed that ethanol is a good sclerotic agent that can be used to treat many vascular malformations in the orofacial regions

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Cytokeratin 19 significance in normal and HPV infected oral mucosa

Dr. Suha A.H. Hind,
B.D.S, H.D. cons., M.Sc Oral Pathology, Ph.D Oral Pathology, College Of Dentistry, University Of Babylon.

ABSTRACT

Background

The present retrospective study was performed on normal oral mucosa and infected oral mucosa with human papilloma virus (HPV).
With main objective to establish the expression of cytokeratin 19 in normal and HPV infected oral mucosa due to the virus effect.

Materials and Methods

This study involves a total of (34) cases, (24) sections from oral mucosa of 24 females were infected with HPV virus, and (10) sections from normal mucosa. The expression of cytokeratin 19 was carried out on 4µm specimen sections using Immuno histochemical staining of cytokeratin 19 antibody.
The staining demonstrated the expression intensity, percentage and localization.

Results

Results show cytokeratin 19 was expressed in both normal and HPV infected oral mucosa, but the expression in infected mucosa was significantly different from that of normal one, and the intensity of the staining was more in the basal layer of infected mucosa than normal, in addition to that results show both nuclear and cytoplasmic expression and involves the whole layers of the infected mucosa.

Conclusion

HPV can infect oral mucosa and persistent HPV infection in the oral mucosa might increase the risk of developing oral cancer due to its effect on the differentiating host keratinocyte cells, so HPV infection is one of the contributing factors for OSCC.
Key words: Cytokeratin 19, Human papilloma virus (HPV).

INTRODUCTION:

Cytokeratins (CK) are one of the main families of intermediate keratin filament. They make up the cytoskeleton of both normal and malignant cells of epithelial origin. Among them CK19, a 40KDa epithelial cytoskeletal protein, has been used as a marker for cancers of epithelial origin. CK19 is not expressed in normal hematopoietic cell. Detection of CK19 transcript in peripheral blood of a patient with known OSCC should indicate the presence of carcinoma cells[1].

Cytokeratins (CK) are intermediate filaments, mostly expressed by epithelial cells, which includes a wide range of proteins, varying in molecular weight, isoelectric pH values and affinity [2,3,4]. CK varies among different types of epithelia in their different stages of development, and they may be used as an adjunctive tool for epithelial classification and histological diagnosis [2,5].

Changes in the expression of keratins (Ks), indicating disturbed tissue differentiation, is one possible marker of malignant potential in stratified squamous epithelia. The presence of human papilloma viruses (HPVs) in the epithelium of the uterine cervix is increasingly regarded as a marker of risk for cervical cancer. However a similar role in oral cancer, and precancer remains controversial [6].

Human papilloma virus (HPV) is a member of Human papilloma virus family of viruses that capable of infecting humans. like all papilloma viruses, HPVs establish productive infections only in keratinocytes of the skin or mucous membranes. While the majority of the nearly 200 known types of HPV cause no symptoms in most people, some types can cause warts (verrucae), while others can in a minority of cases lead to cancers of the cervix, vulva, vagina and anus in women, or cancers of the anus and penis in men. It can also cause cancer of the head and neck (tongue, tonsils and throat)[7].

Human papillomaviruses (HPVs) are a group of more than 150 related viruses. They are called papilloma viruses, because certain types may cause warts, or papillomas which are benign(noncancerous) tumors[7].

Some HPVs, such as those that cause the common warts that grow on hands and feet, do not spread easily. However, more than 40 HPV types are sexually transmitted, and these HPVs spread very easily through genital contact [7].

Some types of sexually transmitted HPVs cause cervical cancer and other types of cancer. These are called high risk oncogenic or carcinogenic HPVs. Other sexually transmitted types of HPV do not appear to cause cancer and are called low risk HPVs [7].

The human papilloma virus is a double stranded DNA virus that infects the epithelial cells of skin and mucosa. The epithelial surfaces include all areas covered by skin and/or mucosa such as the mouth, throat tongue tonsils, vagina, penis and anus [8].

Transmission of the virus occurs when these areas come into contact of a virus allowing it to transfer between the epithelial cells. Oral HPV infection is transmitted sexually, but also can be transmitted from mouth to mouth or vertically from an infected mother during delivery[8].

One of the most common virus group in the world today affecting the skin and mucosal areas of the body, is human papilloma virus[9].

Genital warts are known technically as condylomata acominatum and are generally associated with two HPV types, numbers 6 and 11 [9].

There are other forms of HPV which are sexually transmitted, and are a serious problem. These are HPV-16, 18, 31, and 45. these cancer associated types of HPVs cause growth that usually appears flat, and are nearly invisible as compared with the warts caused by HPV-16 and HPV-11.Two types of genital tract HPV in particular, HPV-16 and HPV-18, are known to cause up to 95% of cervical cancers, and new studies show that they may be linked to oral cancer as well.

OBJECTIVE:

To investigate cytokeratin 19 expression in normal and HPV infected oral mucosa.

MATERIALS AND METHODS:

-Selection of cases and tissue staining:

A retrospective study was carried out at the Surgical Pathology Center in Davanzo Hospital-Foggia-Italy, between April 2008 - July 2008, involving 24 sections (4µm) from formalin – fixed paraffin embedded blocks were cut from oral mucosa of 24 females were infected with HPV virus, and 10 sections from normal mucosa as control.

Immuno histochemistry staining was then performed on the sections that mounted on poly- L-lysine coated glass slides utilizing mouse monoclonal Cytokeratin – 19 antibody[10].

After antigen retrieval by pressure cooking with ethylene diamen tetra-acetic acid (EDTA) solution as a buffer solution, and quenching in 30% hydrogen peroxide and blocking. The sections were incubated with primary antibody Cytokeratin-19. Then biotinylated anti rabbit immunoglobulin and streptavidin conjugated to horse radish peroxidase (HRP) were subsequently applied. Finally , 3,3- diaminobenzidine was used for color development and haematoxylin was used for counter staining.

The results of Immuno histochemical staining were evaluated by two observers which appear as brown pigmentation.

statistical analysis used are, mean ± S.D. for staining expression percentage of cytokeratin 19.

P – value of < 0.05 was considered significant. By using T- test.

RESULTS:

Staining results show:

-Positive expression of cytokeratin 19 in the whole cases of infected oral mucosa (100%). A mean percentage of expression and standard deviation (SD) of cytokeratin 19 in infected HPV oral mucosa is (85.625 ± 7.116), fig.(1&2), as compared with the expression in non infected mucosa with mean percentage (16.4 ± 5.641), fig.(3), and the difference between two expressions is statistically significant, p-value > 0.05, see table (1).

-Cytokeratin 19 positivity shows cytoplasmic expression and nuclear membrane expression as a result of vacuolization of the nuclei due to the effect of the virus, as seen in fig.(1&2), while normal mucosa expression shows cytoplasmic expression in some areas and nuclear in others, as seen in fig.(3 &4).

- The expression of cytokeratin 19 involves the whole layers of infected mucosa, and more intense in the basal layer, fig.(1&2), while in normal mucosa, are seen in basal and para-basal layers with less intensity, fig. [5].

Table (1): Mean expression of cytokeratin 19 in HPV infected mucosa and normal mucosa

Type	Mean ± SD	*p*- value
Infected mucosa	85.625 ± 7.116	> 0.05
Normal mucosa	16.4 ± 5.641	

DISCUSSION:

HPV can infect oral mucosa. A subgroup of oral cancer clearly is associated with HPV. Oral HPV infection is transmitted sexually but also can be transmitted from mouth to mouth and vertically from an

infected mother during delivery [8].

HPV infection is limited to the basal cells of stratified epithelium, the only tissue in which they replicate [11]. The virus cannot bind to live tissue; instead, it infects epithelial tissues through micro-abrasions or other epithelial trauma that exposes segments of the basement membrane[11].

The infectious process is slow, taking 12–24 hours for initiation of transcription. It is believed that involved antibodies play a major neutralizing role while the virions still reside on the basement membrane and cell surfaces [11].

HPV lesions are thought to arise from the proliferation of infected basal keratinocytes. Infection typically occurs when basal cells in the host are exposed to infectious virus through a disturbed epithelial barrier as would occur during sexual intercourse or after minor skin abrasions. HPV infections have not been shown to be cytolytic; rather, viral particles are released as a result of degeneration of desquamating cells. The HPV virus can survive for many months and at low temperatures without a host; therefore, an individual with plantar warts can spread the virus by walking barefoot [12].

Most HPV infections are cleared rapidly by the immune system and do not progress to cervical cancer. Because the process of transforming normal cervical cells into cancerous ones is slow, cancer occurs in people having been infected with HPV for a long time, usually over a decade or more (persistent infection) [13,14].

Several types of HPV, in particular type 16, have been found to be associated with HPV-positive oropharyngeal cancer (OSCC), a form of head and neck cancer [15,16]. HPV-induced cancers often have viral sequences integrated into the cellular DNA. Some of the HPV "early" genes, such as E6 and E7, are known to act as oncogenes that promote tumor growth and malignant transformation. Oral infection with HPV increased the risk of HPV-positive oropharyngeal cancer independent of tobacco and alcohol use [16]. In the United States, HPV is expected to replace tobacco as the main causative agent for oral cancer[12].

E6 and E7 are the HPV proteins associated with cancer. The HPV genome is composed of six early (E1, E2, E3, E4, E6, and E7) and two late (L1 and L2) proteins.(16.19). After the host cell is infected E1 and E2 are expressed first. High E2 levels repress expression of the E6 and E7 proteins. When the host and HPV genomes integrate, E2 function is disrupted, preventing repression of E6/E7 [17].

The p53 protein prevents cell growth and stimulates apoptosis in the presence of DNA damage. The p53 also upregulates the p21 protein, which blocks the formation of the Cyclin D/Cdk4 complex, thereby preventing the phosphorylation of RB and, in turn, halting cell cycle progression by preventing the activation of E2F. In short, p53 is a tumor suppressor gene that arrests the cell cycle when there is DNA damage [18].

The E6/E7 proteins inactivate two tumor suppressor proteins, p53 (inactivated by E6) and pRb (inactivated by E7) [18].

The viral oncogenes E6 and E7 are thought to modify the cell cycle so as to retain the differentiating host keratinocyte in a state that is favorable to the amplification of viral genome replication and consequent late gene expression. E6 in association with host E6-associated protein, which has ubiquitin ligase activity, acts to ubiquitinate p53, leading to its proteosomal degradation. E7 (in oncogenic HPVs) acts as the primary transforming protein. E7 competes for retinoblastoma protein (pRb) binding, freeing the transcription factor E2F to transactivate its targets, thus pushing the cell cycle forward. All HPV can induce transient proliferation, but only strains 16 and 18 can immortalize cell lines in vitro [19].

Kellokoski et al., in 2006 found that in HPV DNA- positive biopsies in the basal cell layer was more intense than in HPV DNA- negative biopsies, and the more efficient expression of Ck 19 in HPV DNA-positive samples suggests that viral infection might accelerate the production of low molecular weight cytoskeletal protein. This could be interpreted as evidence that HPV might disturb the keratinocyte differentiation in the basal cells [20]. In this study same findings are found, in addition to that we found that the expression involves the whole layers of infected mucosa.

Association of high risk human papilloma virus (HR-HPV) with oral cancer has been established recently, detecting these viruses in oral cavity is important to prevent oral lesion related to them. Saini et al., in 2010 studied (105) oral squamous cell carcinomas (OSCC) affecting Malaysian population, found HPV to be significantly associated with OSCC [21].

Oncogenic HPVs have been detected in OSCC. HPV16 is the most frequently detected type of HPVs in oral SCC and is present in up to 22% of cases, either alone or in combination with other HPV types. HPV 18 is present in up to 14% of cases. HPV 16 and HPV 18 are present together in approximately 6% of cases. However, HPV 16 and 18 are also detected in normal oral mucosae (10% and 11%) respectively. These data suggest that high risk HPV infection may be a co-factor in oral carcinogenesis and that latent HPV infection of the oral mucosa is common. A role of HPV infection in oral carcinogenesis is supported by the ability of high risk HPVs to immortalize oral keratinocytes in vitro. Immortalization may involve (i) deactivation of pre-formed tumor suppressor proteins by viral oncoproteins, (ii) blocking of tumor suppressor gene transcription as a result of HPV oncogene insertion or (iii) stimulation of cellular oncogene transcription by the upstream insertion of HPV- derived transcription activating sequences. Hence, infection of oral keratinocytes with high risk HPV may be involved in the pathogenesis of some oral SCCs [22].

The detection of oral HPV infection is done by southern blotting hybridization (SBH) and polymerase chain reaction (PCR) [22].

This study proved the infection of oral mucosa with HPV which characterized by the expression of cytokeratin 19 as compared with normal mucosa specially in the basal layer of keratinocyte cell in which they replicate and result in infected differentiated keratinocyte cells, so involve the whole mucosal layers with long standing infection, these findings were in agreement with many other studies mentioned here.

CONCLUSION:

Cytokeratin 19 was expressed in both normal and HPV infected mucosa, but the expression in infected mucosa is significantly different from normal mucosa and with different distribution throughout the mucosa.

So we conclude that HPV can infect oral mucosa and persistent HPV infection in the oral mucosa might increase the risk of developing oral cancer due to its effect on the differentiating host keratinocyte cells, so HPV infection is one of the contributing factors for OSCC.

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Effect of early cervical preflaring and glide path utilizing rotary PathFiles or manual K-files on the amount of apically extruded debris from curved canals instrumented by rotary ProTaper system.

*Dr Abdul Rahman M. Saleh PhD, MSc, BDS **

Abstract

Introduction: The aim of this study was to comparatively evaluate the amount of apically extruded debris when rotary ProTaper system was used for instrumentation of root canals preceded by rotary PathFiles or manual K-files and the effect of early cervical preflaring on total debris extrusion.

Material and method: Forty mesiobuccal canals of lower first molar teeth, with 20 to 40 degrees of root canal curvature, were selected. A size 8 K-file was placed up to the apical foramen to determine the patency. Working length was determined with the same instrument, 1 mm short of the foramen. According to the employed technique, the groups were labeled and initial instrumentation was performed as follows: Group (1-A) initial instrumentation by hand K-files without cervical preflaring; Group (1-B) initial instrumentation by hand K-files with cervical preflaring; Group (2-A) initial instrumentation by rotary PathFiles without cervical preflaring; Group (2-B) initial instrumentation by rotary PathFiles with cervical preflaring. Further instrumentation of all canals was completed by rotary ProTaper system. During instrumentation, each root canal was irrigated with 10 mL distilled water. Debris extruded through the apical foramen was collected using the Myers and Montgomery technique.

Result: Data obtained were analyzed using Kruskal-Wallis one way analysis of variance and Mann-Whitney U test with P=0.05 as the significance level. The results show no statistically significant difference among the groups.

Conclusion: There is no statistically significant difference of early cervical preflaring on the total amount of apically extruded debris. Also there is no statistically significant difference between rotary or manual glide path on the total amount of apically extruded debris.

Introduction

The objectives of endodontic instrumentation include thorough debridement and disinfection of the root canal system, in addition to creating a suitable shape to achieve a complete 3D obturation. In an effort to obtain these objectives, debris such as dentinal shavings, necrotic pulp tissue, bacteria and their byproducts or irrigants may be extruded into the periradicular tissue [1].

A large number of studies have dealt with the effect of various root canal preparation techniques and instruments on the amount of the apically extruded dentinal debris and irrigants.

Apical extrusion of debris tends to be greater with hand instrumentation than with techniques that use rotary forces [2, 3, 4, and 5] because the files may act as pistons that push irrigating solutions and debris towards the apex [6]. Conversely, rotary instrumentation may move debris along the files, which may result in debris being, expelled cervically [7].

A study done by Luisi *et al* found that instrumentation using a continuous rotary technique, ProTaper system, produced greater apical extrusion than the hand and engine-driven crown-down techniques [8]. They stated that the direction of instrumentation, whether cervical-apical or apical-cervical, seems to be a more important factor influencing apical extrusion rather than mode of the instrumentation was performed by hand or engine-driven.

While Tinaz et al revealed no significant difference between instrumentation with hand K-files and rotary ProFile .04 taper files, there was a tendency with both techniques to apically extrude more material as the diameter of the apical patency increased [9].

Blum et al [10] suggested a glide path with small flexible stainless steel hand files to create or verify that within any portion of a root canal there is sufficient space for rotary instruments to follow. Berutti et al [11] underlined the need for preflaring apical part of the canal up to #20 K file for the ProTaper instruments so as to ensure sufficient space for the S1 file, because its tip measures 0.17 mm. They reported that the reduction in torsional stress increased the average instrument lifespan almost 6-fold, while reducing costs and the risk of instrument separation within the canal.

Previously, clinicians were limited to using small stainless steel hand K-files (size 6 up to size 15 or 20) for this purpose. This often resulted in canal blockage, deviation into the canal wall (ledging or false canal), apical zipping or tearing, or a separated instrument. This occurred because the stainless steel file tended to deviate from the canal confines based on clinician use and the impact of remaining tissue and/or calcifications in the uncharted canal space [12].

Recently new PathFile NiTi Rotary instruments for glide path were introduced by Dentsply Maillefer (Ballaigues, Switzerland).The system consists of 3 instruments, with 21-25-31 mm length and 0.02 taper; they have square cross section. The PathFile

#1 (purple) has an ISO 13 tip size; the PathFile #2 (white) has an ISO 16 tip size; the PathFile #3 (yellow) has an ISO 19 tip size.

Berutti et al found NiTi Rotary PathFiles appear to be suitable instruments for safe and easy creation of the glide path before use of NiTi Rotary shaping of the canal. PathFiles demonstrate better maintenance of the original canal anatomy with less modification of canal curvature and fewer canal aberrations compared with manual glide path performed with stainless steel hand K-files [13].

Using an instrumentation technique that minimizes apical extrusion would be advantageous to both the practitioner and the patient.

The main objective of the present study was to assess the apical extrusion of dentine debris as a result of using NiTi rotary PathFile or manual K-file with or without early cervical preflaring followed by ProTaper system.

Material and method:-

1. Canals selection:
A total of forty mesial roots of extracted human mandibular first molar teeth with mature apices and with no previous root canal treatment were collected after excluding those with cracks, fractures, and resorption. Buccal and proximal radiographic examinations were performed to exclude roots with open apices, calcified or extra canals. The surfaces of the roots were cleaned using periodontal curettes , kept in sodium hypochlorite solution 2% overnight for surface disinfection followed by storage in 10% buffered formalin .
Only mesiobuccal canals of the selected root were included for this study. Canal curvatures were measured according to Schneider method [14]. Canals with curvature between 20 to 40 degrees were selected.
Crowns were resected to the cemento-enamel junction using a high speed carbide disk to give a standard tooth length of 12±2 mm. Canal patency was controlled with hand K-file size #8 (Dentsply Maillefer, Ballaigues, Switzerland). Working length was determined 1 mm shorter than the length at which the file was visible through the apical foramen. Only canals in which size 10 K-file or less bound at working length were selected.

2. Canals grouping and preparation:
40 canals were divided into two main groups of 20 canals, each according to the files used for glide path as follows; in (group 1) manual K files were used while in (group 2) a rotary PathFile instruments in gear reduction hand piece were used. Each group was further subdivided into two subgroups of 10 canals each as follows: (subgroup A) without cervical preflaring and (subgroup B) with cervical preflaring.

Group 1-A (manual files without cervical preflaring): hand K-files sizes 8, 10, 15 and then 20 (Dentsply Maillefer, Ballaigues, Switzerland) were used with a primary quarter clockwise rotation followed by a pull-back motion until working length was reached.

Group 1-B (manual files with cervical preflaring): Rotary S1 and Sx files were used for early cervical preflaring of the canal. S1 followed by Sx files were inserted at the fixed speed of 300 rpm. Instrument was withdrawn when resistance was felt. Hand K-file sequences were used in the same sequence as the same of group 1-A utilizing hand K files.

Group2-A (rotary files without cervical preflaring): Rotary PathFiles instruments (Dentsply Maillefer, Ballaigues, Switzerland) were used in a 16/1 gear reduction hand piece powered by an electrical motor (X-SMART, Dentsply Maillefer) at the constant speed of 300 rpm. The instruments were used, up to the working length in the following sequence PathFile 1 followed by PathFile 2 and finally PathFile 3.

Group 2-B (rotary files with cervical preflaring): Rotary S1 and Sx files were used for early cervical preflaring of the canal. S1 followed by Sx files were inserted at the fixed speed of 300 rpm. Instrument was withdrawn when resistance was felt. File sequences were used as the same of group 2-A utilizing PathFiles instruments in a gear reduction hand piece at the constant speed of 300 rpm, all to the working length.

For all groups, canals instrumentation was completed by rotary ProTaper system (Dentsply Maillefer, Ballaigues, Switzerland). ProTaper rotary instruments were used in a crown-down manner according to the manufacturer's instructions using a gentle in and out motion. Instruments were withdrawn when resistance was felt and replaced by the next instrument size. File sequences used were: Sx files were used until resistance was encountered (4–5 mm from the working length), S1 and S2 files were inserted till 2/3 of the working length and F1and F2 files were used till the full working length. Hands K-file # 10 was used at the working length between each file in order to prevent

apical blockage.
Ten mL of distilled water irrigant was used for irrigation of the each root canal. Between each file, 1 ml of distilled water was delivered by disposable plastic syringe with a 28-gauge stainless steel needle (Max-p28i, Dentsply, Rinn,USA) that had been placed into the canal as far as possible without bending.

3. Debris Collection:
The method used for apical debris collection was carried out as described by Myers and Montgomery [15]. Each root was forced through a rubber plug so that it could be easily held during instrumentation. The extruded debris and irrigants were collected in a pre-weighed receptor tube, attached to the lower edge of the rubber plug. Before treatment, each tube was weighed to 10-5 gram precision by an electronic balance. Three consecutive measurements were taken for each tube and the mean value was recorded as a pre instrumentation weight. The root apex was allowed to be hung within the receptor tube. A side-mouth bottle was used to hold the device during instrumentation. The bottle was vented with a 25-gauge needle alongside the rubber plug to unify the pressure inside and outside the bottle. The bottle was obscured with a tape so that the operator was shielded from seeing the root apex during the instrumentation. Once instrumentation had been completed, each root was separated from the receptor tube and the debris adhering to the root surface was collected from root surface by washing the root with 2 mL of distilled water into the receptor tube. The receptor tubes were then stored in an incubator at 68˚C for 7 days in order for moisture to evaporate before weighing the dry debris.
4. Debris weighing:
An electronic balance was used to weigh the debris at 10-5 gram precision. This was repeated until three consecutive identical weights were obtained for each sample and the mean value was recorded as a post instrumentation weight. Mean pre-instrumentation weights were deducted from the mean post- instrumentation weights and the difference was recorded as the weight of extruded debris.

5. Statistical analysis:
The mean dry weights of extruded debris were analyzed statistically using SPSS (version 13.0). The Kruskal-Wallis non-parametric test and Mann-Whitney U test was applied to determine if significant differences existed between groups ($p<0.05$).

Result:
Data regarding the amount of debris extruded from all groups are presented in table (1)

Table (1) shows mean weight in mg of dry extruded debris apically during cleaning and shaping of each group.

Group	Mean	Std Deviation	Range
Group 1-A	.033520	.0205388	.000-
Group 1-B	. 029630	.0212485	.000-
Group 2-A	.027490	.0176193	.000-
Group 2-B	.037880	.0239471	.001-

All instrumentation techniques tested produced measureable amount of debris extruded apically. No significant difference in the quantity of debris extruded apically was noted among the different groups. The result shows no significant difference among the different groups whether using rotary or hand glide path. On the other hand, there is no effect of early cervical flaring on the amount of debris extruded apically.

Discussion:
A major objective in root canal treatment is to obtain a clean root canal system. Dentine chips, pulp tissue fragments, necrotic tissue, microorganisms, and intra-canal irrigants may be extruded from the apical foramen during canal instrumentation. This is of concern since material extruded from the apical foramen may be related to post instrumentation pain or to a 'flare-up'.

The extrusion produced by the various techniques was expected, because it is considered a problem of all canal instrumentation methods.

The main objective of the present study was to evaluate and compare the amount of apically extruded debris with the rotary ProTaper systems preceded by manual or rotary glide path and the effect of early cervical preflaring on that. In our study, a single operator prepared all the canals to eliminate the inter-operator variable. A standardized protocol was followed to increase the probability that the amount of apically extruded debris was a result of instrumentation and to decrease the number of variables involved. The mesiobuccal canals of lower first molar used for this study were carefully selected to have a closed mature apex and tiny canal (only sizes less than size10 could pass to the working length). The teeth were decoronated at the CEJs, which helped to obtain a fixed and reliable reference point as well as an approximately similar working length of 12 ± 2 mm. A fixed amount of distilled water (10 mL) was chosen as an irrigant

for this study to reduce the chances that particulate matter indwelling in other irrigants might possibly skew the final values. The size of the master apical instrument was kept constant the ProTaper rotary F2.

According to the manufacturer, PathFiles are a 3-file system of .02 constant taper, with a square cross section and an improved tip design reducing the risk of ledges and canal transportation [13].

The results of this study demonstrate that all instruments tested caused a measurable apical extrusion of debris. This is in agreement with a previous in vitro study which compared the quantity of debris and irrigant extruded apically using the ProTaper system to other systems [7, 8, 16].

Rotary NiTi PathFiles and small sizes of manual K-files have virtually eliminated the problems encountered when trying to create an acceptable and predictable pathway prior to the use of larger or variably tapered NiTi instruments. Their smaller taper gives increased flexibility and more resistance to cyclic fatigue. This means less canal transportation, more flexibility, faster instrumentation time, preservation of the original canal anatomy, no transportation of the apical foramen, and no ledges if they are used short of the desired working length [12].
In our study no instrument fracture occurred. One possible reason for no breakage could be the elimination of interference carried out by the glide path files whether rotary or manual which help to eliminate potential anatomical problems before rotary instrumentation and reduce the taper lock of the tip of ProTaper files.

In our study, we used rotary ProTaper systems which has characteristic features such as a progressive taper and a modified guiding tip. These files demonstrate a convex and triangular cross-section design, which results in a reduced contact area between the dentin and the cutting blade of the instrument, allowing it to achieve a greater cutting efficiency. They also have active cutting blades with a positive rake angle. Their design features include a variable helical angle and balanced pitches, which allow for debris removal and prevent the instrument from screwing into the dentinal walls of the canal. A significant advantage of the ProTaper system is a reduction in the number of instruments used which saves time and operator fatigue.

The general view in endodontic literature is that linear filing motion extrudes more debris apically than rotational motion. In our study we did not find a significant difference between the manual or rotary glide path .The reason for the non-significant results may be because both those instruments have similar and smaller taper which is 2% which is not enough to make aggressive cutting effect and they could provide advantages in the form of a less invasive and safer approach to the subsequent canal instrumentation with any NiTi Rotary system.

Comparing the mean weights of apically extruded debris (table no 1), although there is a difference in the movement between the rotary PathFiles (continuous rotation) and manual K-files (combination of watch-winding and push-pull) which results in an increase of amount of extruded debris with manual K-file group as compared with the rotary groups, but it was not statistically significant. The reason for that is probably related to the fact that both rotary and manual glide path file are used for scouting and initial enlargement to prepare space for the large taper and aggressive files to shape and clean the canals.

Tanalp et al. compared ProTaper systems (without using glide path) with other continuous rotary techniques and found significantly greater amounts of extruded debris when using the ProTaper technique. In their study, this technique had significantly more apical extrusion results than those found for a hand technique and a reciprocating rotary technique. Although the ProTaper System uses fewer instruments, it promotes greater dentin wear in a shorter time because of its greater cutting capacity and taper. The other techniques in their study (hand and alternating rotary technique) required the use of more files with only one, lower taper (0.2 mm). Their cutting capacity was, therefore, lower, and the root canal was prepared slowly and gradually until the working length was reached. The tapering of the ProTaper files favors the preparation of the apical third as soon as instrumentation begins. Thus, wear occurs early throughout the whole canal because the instruments reach the working length in the beginning of the preparation, which causes greater apical extrusion [7].

There are many advantages of early cervical preflaring on the initial file working length and accuracy size determination [17], but there is no study of its effect on the amount of extrusion of debris apically.
Although there is a better tactile sensation and easy insertion of all the successively used files during the

process of cleaning and shaping, our study did not find any significant difference as a result of using or not using the early cervical flaring .The reason why it does not decrease the extruded debris can be that it will allow more irrigation to push debris apically especially those which are suspended after file planed the canal wall.

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. * Dr Abdul rahman M Saleh is Assistant Professor, Department of Restorative Dentistry ,Ajman University of Science and Technology ,UAE. For further details contact at
E-mail :drabdulrm@yahoo.com
00971502283188

Comparative study of retention of fiber-Reinforced post at middle and cervical one thirds of root canal cemented by Glass ionomer and Self adhesive Resin cement measured at different times

Dr.Mohammed R., P.H.D. and Dr.Saad Zabar A., M.Sc
collage of dentistry ,University of Baghdad ,Conservative Dentistry

Abstract:
The purpose of this study was to compare regional bond strength at middle and cervical thirds of the root canal among glass fiber-reinforced composite (FRC) endodontic posts luted with different cements, using the push-out test to compare the performance (retention) of two types of luting cements ;Glass ionomer cement and resin cement used to cement translucent fiber post and to compare the result of the push-out test at different storage times;1 week ,1month and 2 months.
Sixty caries-free, recently extracted single-rooted human teeth with straight root canals was used in this study, The root canals were endodontically instrumented at a working length of 0.5 mm from the apex by means of conventional instruments for hand use (Dentsply, Switzerland) up to size 35.then root canal filling was performed followed by post space preparation up to 8mm including cervical and middle one third of root canal then the fiber post was cemented into canal post space then the root was sectioned to get cervical (4 mm in length) and middle (4 mm in length) thirds ,these thirds were examined by push out test to get values of retention of fiber post inside these canal thirds .The results of this study has been showed that there was higher significant more push out bond strength between fiber post and root at cervical third as compared with middle third also the results showed that there was higher significant differences between push out bond strength between the two types of dental cements used to cement the fiber post to the root canal and after 1 month and 2 months the push out bond strength was increase for both types of cements.
Keywords: glass fiber post, push out retention ,glass ionomer, self adhesive Resin

Introduction:

The root posts have been used to retain coronary restorations and to improve the distributions of stress through dental structure. There are several types of root posts commercially available in the market, among which, glass fiber posts[1].
Fiber posts have been introduced in the early 1990s to restore endodontically treated teeth with an excessive loss of dental structure as alternative to cast post-and-core and metal dowels[2]. Because their elastic modulus is claimed to be similar to that of the dentin, the risk of vertical root fracture is expected to be reduced[3]. Furthermore, quartz or glass fiber posts (white or translucent) can be used in situations of higher esthetic demands[4].

The adhesion of cements can be influenced by the anatomical and histological characteristics of the root canal, including the orientation of the dentin tubules[5]. Moreover, since the number of tubules decreases from the crown to the apical root[6], Bond strength can be determined by several techniques, but the push¬ out bond strength test is believed to provide a better estimation of the actual bonding effectiveness than a conventional shear bond strength test. Using a push-out protocol, failure occurs parallel to the post-cement-dentin interface which similar to the clinical condition Although the micro tensile method has also been applied to root dentin, the push-out test seems to be more reliable because of the absence of premature failures and the variability of data distribution[7].
The aim of the study was to compare regional bond strength at middle and cervical thirds of the root canal among glass fiber-reinforced composite (FRC) endodontic posts cemented with different cements, using the push-out test, to compare the performance (retention) of two types of luting cements Glass ionomer and self adhesive Resin cement when used to cement translucent fiber post And to compare the result of the push-out test at different storage times

Material and methods:

Methods;

Sample selection: Sixty caries-free, recently extracted single-rooted human teeth with straight root canals will be used in this study. The inclusion criteria were absence of caries or root cracks ,no fractures ,no external resoption and X-ray will be taken to confirm no signs of internal resorption ,no calcification ,single canal and absence of previous endodontic treatments. Teeth will be stored in 0.1% Thymol at room temperature.

Preparation of acrylic blocks:

Each tooth will be fixed inside and at the base of clear tube with sticky wax at it apex then the clear acrylic will be mix and pour inside the clear tube till the tooth will be completely embedded inside the clear acrylic ,then crown portion of each tooth was sectioned perpendicularly to the long axis of the tooth at the cementum-enamel junction level, using a sectioning instrument under copious water cooling leaving 12mm root length embedded inside acrylic for further steps

Root canal preparation:

The Root canals were endodontically instrumented at a working length of 0.5 mm from the apex by means of conventional instruments for hand use (Dentsply, Switzerland) up to size 35. After each instrumentation,

root canals were flushed with 2 mL of 2.5% sodium hypochlorite and dried with adsorbent paper points . Canals were filled with cold lateral gutta-percha condensation using gutta-percha size 35 as master cones and size15as accessory cones, and Ah2 root canal sealer the sealer will be mixed, according to manufacturers' instructions. after filling the access chamber with temporary filling material , all root canals were stored in distilled water at 37C for 1 week, 1mounth and 2 month period , to study the effect of storage periods on the results of this study .

Post space preparation

Filling material of the middle and cervical thirds was then removed with Pesso drills (Maillefer-Dentsply), and the canal wall of each specimen was enlarged with low speed FRC Postecl drills (Ivoclar, Schaan, Liechtenstein) under copious water cooling, following the manufacturer's instructions, creating a 8-mm length post space (measured from cemento-enamel junction) with a no. 3 post drill, keeping at least 4mm of gutta-percha apically.

Groups:

Teeth were randomly assigned into two main groups (Group A and Group B, n=30 each), depending on the type of cement will be used; self adhesive Resin (ReyxTM U100 ;USA) and Glass ionomer cement(Medicem,Promedica; Germeny). And then each group is sub-divided into three groups (n=10 each), depending on storage period;1 week(A1 and B1), 1 month(A2 and B2) and 2 month period(A3 and B3) each root was sectioned into cervical(A1c,A2c,A3c,B1c,B2candB3C)and middle(A1m,A2m,A3m,B1m,B2m and B3m) thirds.

Post luting procedure

Group A(A1,A2 and A3):

cement will be mixed according to manufacturer instruction The post space will be irrigated with distilled water and dried with paper points then the Glass ionomer and then will be used to cement the fiber post into post space (8mm of canal filling the middle and cervical one third of the canal space

Group B(B1,B2 and B3):

The post space will be irrigated with distilled water and dried with paper points then the self adhesive Resin cement will be mixed according to manufacturer instruction and then will be used to cement the fiber post into post space (8mm of canal filling the middle and cervical one third of the canal space

Preparation of Specimens for the Push-Out Bond Strength Test:

Specimen will attached to the holder to keep it fix and then with sectioning disc under cooling water the specimen will be sectioned perpendicular to the long axis under water cooling. Three slices per each root representing cross-sections of cervical and, middle of the bounded posts will be obtained. Each slice was marked on its apical side with marker. The thickness of each specimen was measured with vernea. The sections will be stored individually in black container with sterile water. Push-out tests will be performed by applying a compressive load to the apical aspect of each slice via a cylindrical plunger mounted on a Universal Testing Machine managed by pc software. Because of the tapered design of the post, three different sizes of punch pin: 1.1 mm diameter for the coronal, 0.9 mm for the middle, will be used for the push¬ out testing. The punch pin was positioned to contact only the post, without stressing the surrounding root canal walls Care will also taken to ensure that the contact between the punch tip and the post section occurred over the most extended area, to avoid notching of the punch tip into the post surface. The load was applied to the apical aspect of the root slice and in an apical-coronal direction, so as to push the post towards the larger part of the root slice, thus avoiding any limitation to the post movement. Loading was performed at a crosshead speed of 0.5 mm min) 1 until the post segment was dislodged from the root slice [8].

A maximum failure load value will recorded (Netween) and converted into MPa, considering the bonding area of the post segments. Post diameters were measured on each surface of the post/dentine sections using the digital caliper and the total bonding area for each post segment was calculated using the formula:

$\Pi(R1+R2)\ (R1-R2)^2 + h^2$

Where: R represents the coronal post radius, r is the apical post radius and h is the thickness of the slice. All fractured specimens were carefully removed and observed under stereomicroscope at 20 and 50 magnification from the cervical as well as from the apical direction to determine, for each root third, the mode of failure, which were classified into five types[9]:

(i) Adhesive between post and resin cement (no cement visible around the post).

(ii) Mixed, with resin cement covering 0-50% of the post diameter.

(iii) Mixed, with resin cement covering 50-100% of post surface.

(iv) Adhesive between resin cement and root canal (post enveloped by resin cement).

(V) Cohesive in dentine.

Results :

The results showed (figure 1 and table 1)that the group (B3c) has the highest push out bond strength while the group (A1m) has the lowest push out bond strength .

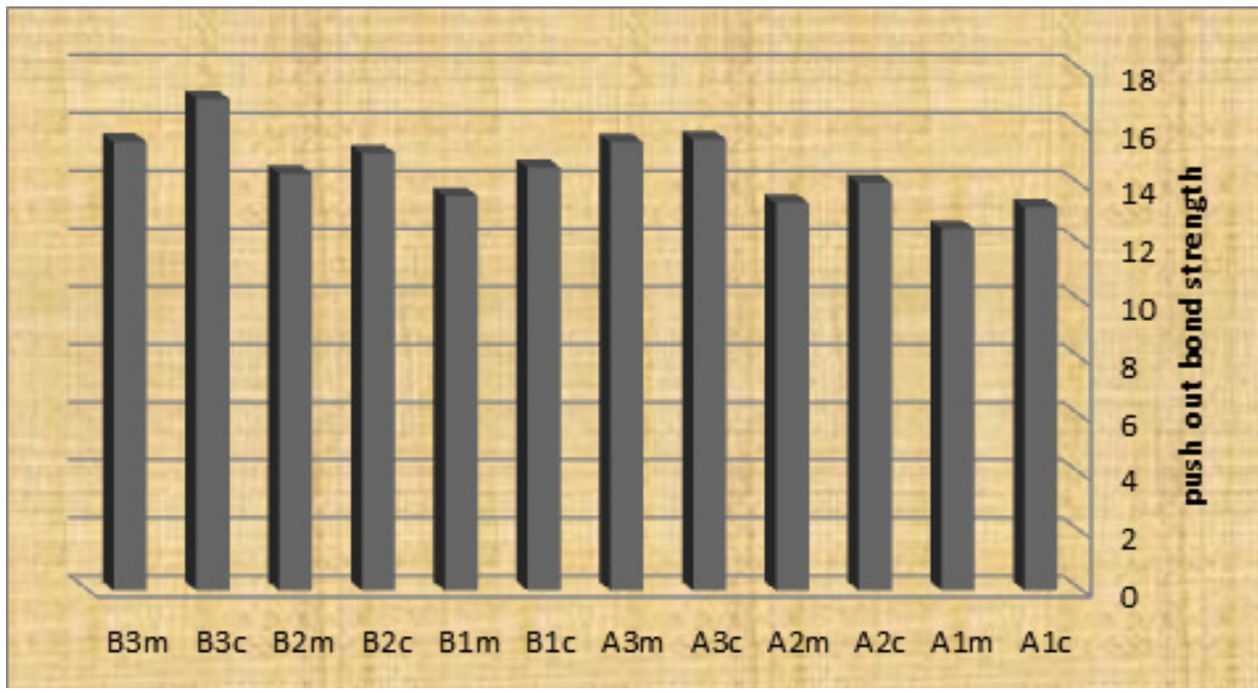

Figure 1: Push out bond strength (MPa) of all groups of this study.

Table 1 : Mean and standard deviation (MPa) of push out bond strength of all groups of this study.

Cement type	Root third	Storage period	N	Mean	±Sd
Glass ionomer cement (A)	Cervical (c)	1 week (A1c)	10	13.26	0.22
		1 month (A2c)	10	14.1	0.21
		2 month (A3c)	10	15.6	0.36
	Middle (m)	1 week (A1m)	10	12.5	0.16
		1 month (A2m)	10	13.4	0.14
		2 month (A3m)	10	15.5	0.14
Resin cement (B)	Cervical (c)	1 week (B1c)	10	14.62	0.2
		1 month (B2c)	10	15.12	0.26
		2 month (B3c)	10	17	0.37
	Middle (m)	1 week (B1m)	10	13.64	0.13
		1 month (B2m)	10	14.42	0.15
		2 month (B3m)	10	15.52	0.22

A-Push out bond strength for self adhesive resin and glass ionomer cement at middle and cervical third of root canal:

LSD test (table 2) showed that there was higher significant differences between push out bond strength between fiber post and root at cervical third as compared with middle third, except when we compared the group A3c with group A3m the result showed there was no significant differences between them.

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Table 2: LSD test to compare push out bond strength between cervical and middle third of root of tested groups

Comparism (I)Group X (J)Group	Mean differences(I-J)	Significance
(A1c) X (A1m)	0.101	0.000*
(A2c) X (A2m)	0.696	0.000*
(A3c) X (A3m)	0.095	0.349
(B1c) X (B1m)	0.98	0.000*
(B2c) X (B2m)	0.7	0.000*
(B3c) X (B3m)	1.48	0.000*

* significant at (P<0.05)

B-Push out bond strength for the type of cement (self adhesive resin and glass ionomer cement):

LSD test (table 3) showed that there was higher significant differences between push out bond strength between the two types of dental cements used to cement the fiber post to the root canal, except when we compared the group B3m with group A3m the result showed there was no significant differences between them.

Table 3: LSD test to compare push out bond strength between the two types of dental cements used to cement the fiber post to the root canal.

Comparism (I)Group X (J)Group	Mean differences(I-J)	Significance
(B1c) X (A1c)	1.36	0.000*
(B1m) X (A1m)	1.14	0.000*
(B2c) X (A2c)	1.02	0.000*
(B2m) X (A2m)	1.02	0.000*
(B3c) X (A3c)	1.4	0.000*
(B3m) X (A3m)	0.15	0.882

* significant at (P<0.05)

C-Push out bond strength for self adhesive resin and glass ionomer cement at 1 week, 1 month and 2month storage periods:

LSD test (table 4) showed that there was significant differences increase in push out bond strength for the two types of dental cements used to cement the fiber post to the root canal after one and two months

Table 4: LSD test to compare push out bond strength for self adhesive resin and glass ionomer cement at 1 week, 1 month and 2month storage periods.

Comparism (I)Group X (J)Group	Mean differences(I-J)	Significance
(A1c) X (A2c)	-0.835	0.000*
(A1c) X (A3c)	-2.344	0.000*
(A2c) X (A3c)	-1.509	0.000*
(A1m) X (A2m)	-0.897	0.000*
(A1m) X (A3m)	-3.007	0.000*
(A2m) X (A3m)	-2.11	0.000*
(B1c) X (B2c)	-0.5	0.000*
(B1c) X (B3c)	-2.385	0.000*
(B2c) X (B3c)	-1.885	0.000*
(B1m) X (B2m)	-0.78	0.000*
(B1m) X (B3m)	-1.885	0.000*
(B2m) X (B3m)	-1.105	0.000*

* significant at (P<0.05)

One-way ANOVA test (Table 5) showed that there was statistically significant difference among all the groups at the P value less than 0.01

Table (5):ANOVA test for push out bond strength for self adhesive resin and glass ionomer cement at cervical and middle roots thirds with 1 week, 1 month and 2month storage periods.

	Sum of square	df	Mean square	F	*P*(value)
Between groups	175.665	11	15.970	312.595	*P*<0.01
Within groups	5.517	108	0.051		
Total	181.182	119			

d.f.=degree of freedom *P*-value=probability

Discussion:

Various methods are available to analyze the adhesive bond strength of cement and bond strength of the fiber posts. The two most commonly used technique are the micro tensile bond strength (MTBS) and the push out test. Most scientists prefer the push out test for the analysis of fiber posts bond strength to root dentine because it has been documented that the results of this test are more reliable for posts compared to the MTBS test/By using the push out test, the premature loss of samples during the manufacturing of the specimens is reduced. Furthermore, the micro push out test enable the measurement of bond strength to very small areas such as the interior of a root canal[10].

Self-adhesive resin cements were designed to overcome limitations of both traditional and resin-based cements and simplify the bonding process. Practitioners prefer materials that are easy to use, and it has been considered that ease of use facilitates improved performance[11]. It could therefore be considered that a resin luting material that does not require the etching and bonding steps presents distinct advantages to the clinician when compared with traditional resin luting materials in terms of ease of use and potential savings in time and chair-side costs. Several studies have indicated that the bond strength values of self-adhesive cements are comparable to or even higher than those of etch-and rinse and self-etching primers luting techniques[12,13].

1. The effect of root third on bond strength of fiber post to the root canal:

The result of the present study showed that both of the two cements used demonstrate a measurable adhesive property, with the highest values for the cervical third and the lower values for the middle third.
Several factors may contribute to the reduction in the bond strength from
coronal to apical direction. Some of these factors are inherited to the root dentin composition, and others are related to the restoration techniques used[14].

2. The effect of type of cements on bond strength of fiber post to the root canal:

The result of this study showed higher bond strength gain when resin cement was used to cement fiber post to the canal walls Adhesive resin cement has been advocated for cementation of the post because they bond the post to tooth structure with greater strength than other cements[15] . it is generally accepted that resin cement produce lower shrinkage stresses due to their lower curing rates that allow more stress relief by polymer flow[16].

3- The effect of storage period on bond strength of fiber post to the root canal:

The result of this study showed that there was increase in push out bond strength for the two types of dental cements used to cement the fiber post to the root canal after one and two months this may be related to complete setting reaction of dental cement providing better resistance to dislodging forces[17].

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Comparison the Surface Roughness of Polishing And Glazed Ceramic With Glazed Zirconium Based Ceramic

Dr. Sabiha Mehdy Kanaan

Abstract

Porcelain veneer restoration often require modification at laboratory and chair side prior to cementation .Common adjustments include contour, occlusion , color correction , and special characterization masking of imperfections and final glazing.

The purpose of this study to compare surface roughness of polished, glazed porcelain with ceramic based zirconium.

Thirty samples {Twenty porcelain specimens resembling flat-back facing (Metal porcelain buttons) of vita ceramic and ten specimens of ceramic based zirconium } were fabricated according to the manufacturer's Instructions.(prepared with dimension of (10mm) in diameter and (2mm) in thickness).

The specimens were divided into three groups according to the type of surface treatment tested .Each group consisted of ten specimens and the groups were distributed as follows:-

- Group A: Polished unglazed porcelain with Rubber wheel.
- Group B: Glazed ceramic based Metal.
- Group C: Glazed ceramic based with zirconium.

The surface roughness evaluation of the specimens was carried out by a surface roughness analyzer device (profilometer).

Statistical analysis of data using (ANOVA- one way test) indicated high significant differences among the tested groups.

The highest roughness value was scored by group A (porcelain polished with rubber wheel) followed by group B (glazed ceramic based Metal.) then group C (glazed ceramic based zirconium).

- Group (A) showed statistical significance in comparism to group (B).
- Group (A) showed high statistical significance in comparism to group(C)
-Group (B) showed statistical significance in comparism to group(C).

According to the conditions under which this study was carried out, it may be concluded that mechanical finishing, polishing procedures were not able to provided a surface as smooth as the glazed surface for the tested porcelain.

Introduction

Dental porcelain have been modified to a state of near-perfection but still they exhibit ceramic disadvantages .The most serious is their tendency to abrade all structures against which it occludes including natural teeth and various type of non-porcelain restorative systems (**Lein felder , 2001**) .

In addition to the improved esthetic properties, such as translucency, color and intensity , the main advantages of dental porcelain materials are excellent biocompatibility and durability. (**Anusavice, 1996**). With the increase in the crystalline content of dental ceramics and increase in their mechanical properties, it has become possible to use them more safely in oral rehabilitation(**Scottt al 1995**).Alumina /zirconia-reinforced ceramics can be indicated for fabrication of fixed prosthodontics and implant abutments ,as alternative or substitute to the metallic framework(**Ardelin Bi2002**)

Dental ceramics and the high crystalline content ceramic framework of metal-free bonded prosthesis and implant abutment is often exposed to the oral environment. In these cases, the framework ceramic surface should be as smooth as possible, with the aim of minimizing the bacterial colonization and dental biofilm formation (**Rimondini et al 2002**). Grinding and polishing procedures to adjust ceramic restorations may also produce a rougher surface which may cause an increased rate of biofilm accumulation , producing gingival inflammation and adverse soft tissue reaction (**Rimondini etal 2002**). In addition, the occlusal adjustments may cause wear of the opposing teeth and also impair the strength of the ceramic restorations(**Fiscer et al 2003**).

Surface roughness refers to the finer irrigularities to the surface texture that usually result from the action of the production process or material condition and is measured in micrometers.Generally ,a smooth surface is desirable to reduce retention of bacteria and to have a shiny appearance (**Craig et al, 2004**).

This study aimed to compare the surface roughness of polished and glazed ceramic based metal with glazed ceramic based zirconium.

Material &Methods

In the present study thirty samples (twenty porcelain specimens resembling flat – back facing metal porcelain buttons) of vita ceramic and Ten specimens of zirconium based ceramic) are fabricated according to the manufactures .In fabrication of porcelain specimens, a sheet of modeling base plate wax 2 mm in thickness was punched with copper ring (10 mm in diameter)

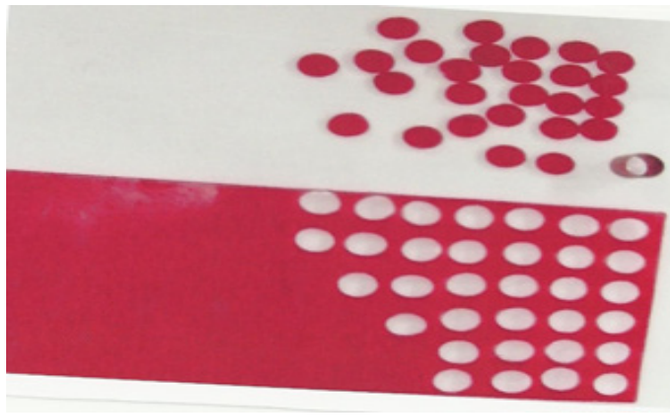

Figure 1

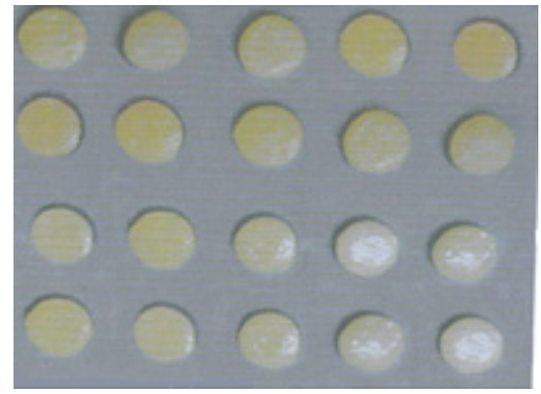

Figure (2) Metal ceramic sample

Spruing and investing of the specimens using phosphate bonded investment .burn out furnace used for burn out then casting using nichel-cromium ceramco alloy (super bond American Dent). Finishing of the metal disc done For standardization of a flat metal surface, to receive porcelain build up, each sample was sand papered (220 grit) manually at (1 cycle / sec.) For 50 sec. (**Zakaria and Al Na'ami, 2002**). Finally each sample was rechecked at three points (one in the middle and two in the periphery) for it's thickness which was about 2mm.

All samples was oxidized and Opaque porcelain was applied according to the manufactures instructions , dentin and enamel layer were applied by using bristle dental brush and baked together After complete porcelain buildup , the surface of porcelain was brought to a fine finish prior to glazing or polishing by using diamond finishing disc . (Rosensteil et al ., 1995) . The final thickness of each specimen (porcelain + metal) was (4.0 mm +_ 0.5) and was standardized using a micro meter at 5 points reading for each sample . The Sample of Zirconium Ceramic are fabricated according to the manufactures instruction Using Manual coping milling machine, preparing frameworks for veneering , the stabilizer bars with diamond disc , smoothing the surface with zirconium dioxide stones blast structure with aluminum oxide.

The samples were divided into three groups, each having ten samples, follow:

Group A: porcelain polished with Rubber wheels. All samples were sand papered with straight hand piece at 35.000rpm speed (one disc \ each sample) then treated with ceramic

II: Samples were subjected to applied glaze by bristle dental brush technique and then subjected to a temperature of 900 ˚C in the computerized porcelain furnace (without vacuum), with a holding time of one minute without vacuum rubber wheel at the same speed using one rubber wheel for each sample.

Group B: Samples were subjected to applied glaze by bristle dental brush technique and then subjected to a temperature of 900˚C in computerized porcelain furnace (without vacuum), with a holding time of one minute without vacuum.

Group C: Zirconium samples with applied glaze. Figure (3)

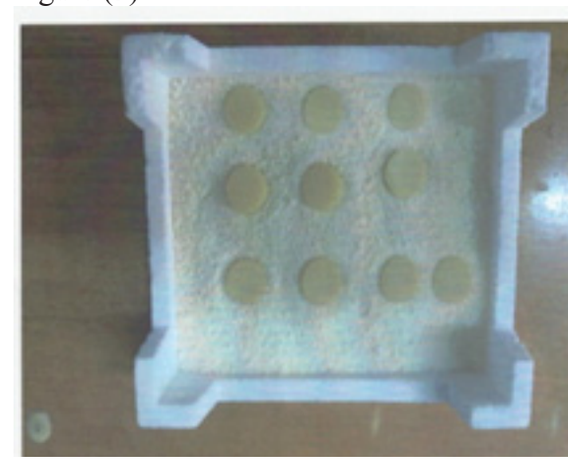

Figure (3)

The samples, after polishing were cleaned with distilled water for 5 min. then dried before profilometric testing.

A surface roughness tester device was used to verify the surface

topography of the polished samples and the glazed one .For each specimen, three readings were recorded (first reading in vertical line, second reading in horizontal line and third reading radial line "slop line")

The mean value was calculated. Surface profiles of the specimens that represent means of scores for all groups were recorded and analyzed.

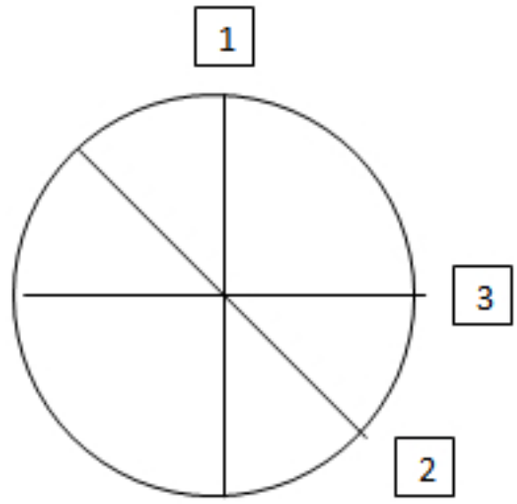

Fig (4) profilometric reading pattern for each specimen

Table 1: Calibration (Methodology)

	Surface roughness first reading	Surface roughness second reading (n=10)	Differences between first and second reading (n=10)	P (paired t test)
Group A				
Range SE Coefficient of variation %	(0.268 to 0.873) 0.463±0.185 0.0586	(0.244 to 0.831) 0.436± 0.183 0.0579	(0.197 to 0.059) -0.027 ± 0.077 0.0243 16.6%	0.29 (NS)
Group B				
Range SE Coeffiecient of variation %	(0.055 to 0.594) 0.244 ± 0.169	(0.059 to 0.591) 0.24 ±0.167	(0.013 to 0.009) -0.004 ± 0.007 2.9%	0.14 (NS)
Group C				
Range SE Coeffiecient of variation %	(0.134 to 0.283) 0.177 ± 0.048 0.0152	(0.131 to 0.258) 0.175 ± 0.041 0.013	(0.025to 0.012) -0.003 ± 0.012 0.0038 6.8%	0.49 (NS)

There was a small and statistically in significant mean difference in SR. between first and second reading of the same equipment in the same spot in any of the 3 test materials.

The magnitude of errors committed by equipment were random and small ranging between 2.9 to 16.6 of the mean first reading SR.

Results

Surface roughness test results:

Results of surface roughness test in (µm) were obtained for(30)specimens in three Groups which include (10)specimens in each Group that were tested after different surface treatment .

Group A: represent polished unglazed porcelain with rubber wheel.

Group B: represent glazed metal based ceramic.

Group C: represent glazed zirconium based ceramic.

Descriptive statistics:

The descriptive statistics of the difference in Ra values of the three Groups including arithmetic mean ,standard deviation ,standard errors ,maximum and minimum of the samples after different surface treatment are shown in Table .Graphical presentation by bar chart shown the means of difference in (Ra)values of the three groups are shown in Figure

Table (2): Descriptive statistic roughness among tested groups

Groups	No.	mean	S.D	S.E	Range	
					Max	Min
Group A	10	0.492	0.133	0.042	0.782	0.365
Group B	10	0.322	0.139	0.044	0.501	0.148
Group C	10	0.223	0.083	0.026	0.458	0.184
Total	30	0.340	0.1605	0.029	0.782	0.148

No. : Number
S.D : Standard Deviation
S.E : Standard error
Max: Maximum value
Min: Minimum value

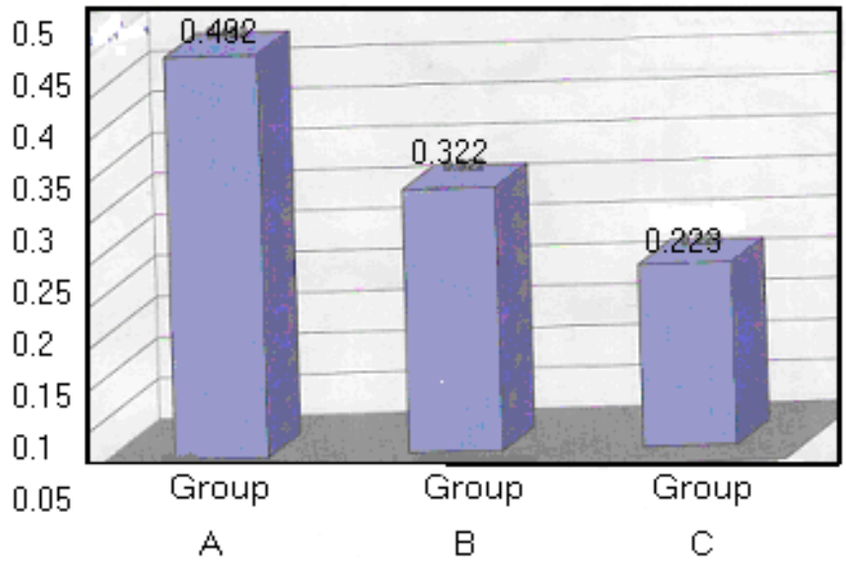

Fig (4-1) Graphical presentation by bar chart showing the means of differences in (Ra) values of the three Groups .

In general the highest mean score of Ra values were recorded in Group **A**b(0.492)which represented the roughest surface followed by Group **B** then Group **C** . Group C showed the lowest mean score of Ra values (0.223) and thus the smoothest surface of porcelain.

Inferential statistics :

Statistical analysis of data by using analysis of variance (ANOVA) revealed that there was statistically highly significant difference among the three Groups at level $P < 0.01$ as shown in table (3).

Table (3) Analysis of variance (ANOVA) of three Group

Anova	Sum of Squares	D.F	Mean of squares	F value	Sig
Between Groups	1430	8	0179	0.008	P<0.01 HS
Within Groups	5361	18	0298		
Total	6790	26			

Least significant difference test (LSD) was performed to compare the pairs of means that gave when comparison done between (Group A and Group B) P value 0.028 that mean $p<0.05$ (significant)and when comparison is done between (Group A and Group C) $p<0.01$ (high significant) and when comparison between (Group B and Group C) P<0.05 (Significant).

Table (4)

	P-value	Sig.
Group A & Group B	0.028	P<0.05 S
Group A& Group C	0.000	P<0.01 HS
Group B& Group C	0.046	P<0.05 S

Table ( ) : The last significant difference (L.S.D)of multiple comparison tests for surface roughness among tested Groups

S: Significant
HS: High significant

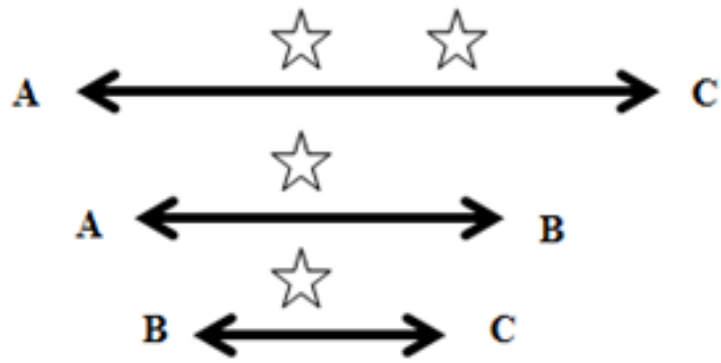

Fig (4-1) Graphical presentation by bar chart showing the means of differences in (Ra) values of the three Groups .

LSD test between Groups

Discussion

Surface finishing is a critical step in achieving an esthetical acceptable restoration, and different materials and instruments may be used (**Patel SB et al., 2004**). Finishing refers to gross contouring or reducing of the restoration to obtain the desired anatomy, while polishing reduces the roughness and scratches created by finishing instruments. Rough poorly polished surfaces contribute to staining, plaque accumulation, gingival irritation .While dental porcelains have been modified to a state of near perfection, they also have a number of decided flaws because of the in homogenous distribution of crystals in a glassy matrix (**Oh et al., 2002**).

If the exposed porcelain surface is not a adequately polished, the ground surface may lead to accelerated abrasive wear of the opposing dentition.

In creased plaque accumulation, and reduced strength of the ceramic restoration (**Anusavice, 1996**) .It is not worthy to verify that a significant correlation was found between the roughness of porcelain surface and the biaxial strength being that the lees roughness the surface, the stronger the sample (**De Jager et al .,2000**).Scanning electron microscopy studies revealed that the initial adhesion of microorganisms beings in irregularities and is subsequently extended to the entire surface(**Nyvad B,Fejerskow O,1987**). Thus, the surface roughness of materials increases both the bacterial adhesion and faster maturation of the biofilm formed, which presents clinical implication, since this biofilm may present more pathogenic micro organisms.The hypothesis set as the premise of this study was accepted, since different technique for surface treatment affected the surface roughness of the evaluated dental porcelain. The Ra parameter obtained with a profilmeter is used to describe the surface texture of the porcelain specimens .This pa-

rameter describes the over all roughness of surface and can be defined as the arithmetical average value of all absolute distance of the roughness profile from the center line within the measuring length.(**Whitehead SA et al.,1995**). According to the results of present profilometer study of specimens showing that the (Group **A**)polished unglazed porcelain with rubber wheel is the roughest among the others Groups .Followed by (Group **B**) glazed metal based ceramic then (Group **C**) glazed zirconium based ceramic .The present study showed that there was significant difference between(Group **A** and Group **B**) and also significant difference between (Group **B** and Group **C**) but there was high significant difference between (Group **A** and Group **C**).

In Group **A** (polished unglazed porcelain with rubber wheel).

In this study we used one polishing technique (Rubber wheel) according to some previous studies that shown all finishing and polishing technique resulted in a similar surface roughness(**SarikayaI,2010**).

The Group **A** shown higher roughness surface among the other Groups. Porcelain rubber wheel may be led to exposure to large bubbles in the surface. Coarser abrasives give rise to rougher porcelain surface .

The differences of pressure and time applied by different practitioner during the polishing procedure .Roughness values of the polished Groups may have varied if the using other rotary instrument ,rough surface have great potential to bacterial adhesion and can be more capable of wearing the opposing teeth (**Jagger DC and Harrison ,1994; Rimondini et al.,2002; Butler CJ et al.,2004**).Various finishing and polishing techniques can use on porcelain surface to preserve its structural resistance and obtain clinically acceptable smoothness comparing with glazing(**Patterson et al,1992; Wring, e t al. ,2004**).

In this study we agree with some studies that showed all finishing and polishing systems tested not provided surface roughness similar to the glazed surface. The polished surface were four times rougher than the glazed specimens of porcelain .This finding is in agreement with previous reports on the effect of different polishing technique on the surface roughness of several dental ceramic .(**Campbell ,1989 ;EI-Karaksi ,et al.,1993;Nishioka RS et al.,1999**). This study disagree with Sulik and Plekavich,1981;Bassing and Wiktorsson ,1982; AL Hadithy,2004 who demonstrates that no difference clinically or by mean SEM between the polished and glazed surface of porcelain ,and some voids are present on the polished surface which are not evident on the glaze. Also we disagree with (**Haywood et al,1988; Zakaria and AL-Na'ami , 2002**) .who found no significant difference could be observed in the quality and surface texture of polished and glaze porcelain.

And stated that final glaze presents the most acceptable surface, and found as a finer abrasive are used followed by adding glaze smoother and more regular. We disagree with previous studies on surface roughness of dental porcelains demonstrated that very smooth surface were obtain when restorations were polished with rubber wheel .(**Camacho GB et al,2006;Sara CD et al.,2006,Wright MD et al.,2004**).

We disagree with the result of (**Scurria and Power,1994**) who concluded that feldspathic porcelain could be polished smoother than glazed and with (**Raimondo et al.,1990**) who reported that two of the four polishing paste tested produced better surface roughness than oven glazing . Also, there was a disagreement with (**Ward et al.,1995 and Kawai et al.,2000**) results who concluded that polishing rendered a smoother porcelain surface than glazing and thus factors less plaque adhesion .

We disagree with A number of studies have been performed to verify finishing and polishing techniques that would create surfaces as smooth or smoother than glazed porcelain .Some researchers preferred polishing porcelain for greater control of surface luster than of glazed porcelain(**Rosenstiel et al.,1989**). Others found no significant difference between the glazed and polished surface (**Grieve et al., 1991**).

- in Group **B** glazed porcelain surface (Metal based ceramic)

The aim of glazing is to seal the open pores in the surface of a fired porcelain. Dental glazes are composed of colorless glass powder, applied to the fired crown surface , so as to produce a glossy surface (McleanJW,1974) Group B was lower roughness than Group **A.**

The cause for lower values of surface roughness due to that applied glaze lead to seal microscpic pitting present on the porcelain surface that produce a satisfactory surface for porcelain restoration related to (**Cornelis and Toursuke,1985,Rosentid,1987;Shi lling burg al., 1997Rosenst 2001,Zakaria and AL-Na'ami,2002)**.

The application of glazing material after grinding will eliminate various defects and flows from the treated porcelain surface causing increase in smoothness of the surface .These findings are in agreement with several previous reports investigation the effect of different polishing techniques on the surface roughness of porcelain .

In this study we agree with the works of (**Suli and plekavich ,1982 ;Klausner et al.,1982;Raimondo et al.,1990;Patterson et al.,1991**)

Who found that a glazed surface of porcelain restoration would be better than polished porcelain surfaces. Conversely we disagree with other studies have shown that polished ceramics produced surfaces that were as smooth as glazed ceramics, or provided smooth surface than glazing (**Haywood VB et al.,1988;SaraCD et al.,2006;WerneckRD and Neisser MP,2008**).

Some explanation for these finding are the differences of experimental designs, dental ceramics and polishing method .Never the less ,these results suggest that surface roughness may be dependent on the combination of ceramic and polishing technique .Investigation of the glazed porcelain surface by **Jaggre** and **Harrison,1994** who showing that the glaze is removed in less than two hours of wear of glazed porcelain surface on a machine designed to simulate the masticatory cycle .They concluded that the amount of enamel wear produced by both glazed and unglazed porcelain is similar, with that polished porcelain is substantially less.

-In (Group **C**)The differences with relationship to the surface roughness observed among the ceramic can be ,probably ,attributed to the micro structural characteristic of the materials as size and it forms of the crystals .The manufacturers of the ceramic VM9 Comment that its microstructure presents more homogeneous distribution of the vitreous phases ,consequently less roughness surfaces are obtained, presenting high resistance to the biofilm formation when compared to the Conventional ceramic However the VM9 ceramic Group **C** showed the lowest mean Ra . value probably due to its finer microstructure and also the conditions of firing and sintering process that effect on porcelain surface.

Possible explanation for this disparity was different polishing rubber wheel and different surface textures of porcelain. (**Kantoriski KZ,2006**)

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The reliability of AutoCAD program in cephalometric analysis in comparison with pre-programmed cephalometric analysis software

Mohammed Nahidh, B.D.S., M.Sc
Lecturer, Department of Orthodontics, College of Dentistry, University of Baghdad
Ahmed F. Al-Jarad, B.D.S., M.Sc.
Assistant Lecturer, Department of Orthodontics, College of Dentistry, University of Baghdad
Zana H. Aziz, B.D.S., M.Sc.
Orthodontist. Ministry of Health. Sulimani Governorate

ABSTRACT

Background: This study aimed to evaluate the reliability of AutoCAD program in cephalometric analysis in comparison with Viewbox 3.1.1 cephalometric computer software.

Materials and method: The sample consisted of 30 digital true lateral cephalometric radiographs of some under- and postgraduate students in the College of Dentistry/ University of Baghdad. Seventeen parameters (11 angular and 6 linear) were measured using the Viewbox 3.1.1 cephalometric computer software and re-measured using AutoCAD program. Descriptive statistics were performed for each parameter and paired samples t-test was obtained to evaluate the difference between both of the methods.

Results: The results revealed the presence of non-significant difference between both softwares.

Conclusions: Cephalometric analysis with AutoCAD program was comparable with Viewbox 3.1.1 software and both of them depend on the landmarks identification by the observer. AutoCAD software is available in Iraq unlike the other softwares and it can be used in clinical diagnosis also suited for research projects.
Key words: AutoCAD, computerized cephalometric analysis.

INTRODUCTION

Since Broadbent [1] and Hofrath [2] introduced the cephalometer in 1931, cephalometric analysis has contributed to the analysis of malocclusion and it has become a standardized diagnostic method in orthodontic practice and research [2–4].

Two approaches may be used to perform a cephalometric analysis: a manual approach and a computer-aided approach. The manual approach is the oldest and most widely used. It consists of placing a sheet of acetate over the cephalometric radiograph, tracing salient features, identifying landmarks, and measuring distances and angles between landmark locations. The other approach is computer-aided. Computerized cephalometric analysis uses manual identification of landmarks, based either on an overlay tracing of the radiograph to identify anatomical or constructed points followed by the transfer of the tracing to a digitizer linked to a computer, or a direct digitization of the lateral skull radiograph using a digitizer linked to a computer, and then locating landmarks on the monitor [5–7]. Afterwards, the computer software completes the cephalometric analysis by automatically measuring distances and angles.

The major sources of error in cephalometric analysis include radiographic film magnification, tracing, measuring, recording, and landmark identification. Previous studies revealed that inconsistency in landmark identification is an important source of error in conventional cephalometry [8-10].

This error is specific to each landmark and affected by experience and training of the observers [11].

Rapid advances in computer science have led to its wide application in cephalometry. Computer-aided cephalometric analysis is faster in data acquisition and analysis than conventional methods. Many cephalometric programs have been developed to perform computer-aided cephalometric analysis by digitizing the landmarks. However, digitizing may introduce errors such as head film movement and improper sequencing of digitized points. To take advantage of image processing and computer-based filing systems that can integrate patients' records and images, the original cephalometric radiographic films may be transformed into a digital format by a scanner or video camera. A radiographic system for taking direct-digital lateral cephalograms at reduced radiation dose is presently available [12,13].

Consequently, many commercially available or customized programs have been developed to conduct cephalometric analyses directly on the screen-displayed digital image [14–15]. Such applications could substantially reduce the potential errors in the use of digitizing pads and totally eliminate the need of hardcopies of digitally born images for conventional cephalometric analysis [15]. Digital cephalometry also has the benefits of image storage, transmission and

processing [8].

Great efforts have been made to develop systems for automatic computerized identification of cephalometric landmarks [4,17]. However, automated systems are at present unable to compete with manual identification in terms of accuracy of landmark position. The landmarks lying on poorly defined structures are difficult to automatically identify due to poor signal-to-noise ratio [8]. Earlier studies revealed that computer-aided cephalometric analysis does not introduce more measurement error than hand tracing, as long as landmarks are identified manually [18,19]. Therefore, manually identifying landmarks on screen-displayed digital images for cephalometric analysis may still be the better strategy.

In Iraq, before 2006, the manual tracing was the dominate method for cephalometric analysis, but after transporting to the digital cephalometric X-ray, the need for a software for cephalometric analysis begins. Al-Nasseri [20] compared the accuracy of the computerized procedure from digitizing the radiograph to the final cephalometric analysis on twenty-six lateral cephalograms using Viewbox 3.0.1 cephalometric computer software. His results showed that computerized angular measurements were more comparable to the manual method than with linear measurements, with most of the differences being of low clinical importance. On the other hand, Uthman and Al-Sahaf [21] measured the effect of film digitization on reliability and validity of some angular and linear cephalometric measurements. They used the Dimaxis pro/classic imaging software (version 3.2.1) for landmarks identification and variable calculations and found that the angular and linear measurements in digital images were comparable with that of original radiograph and are clinically acceptable. This work with this software is not easy, so the need for simple and full option software has been aroused.

Mohammed [22] evaluated the reliability of landmarks identification and their effect on the accuracy of the linear and angular measurements among the conventional, hardcopy and direct digital cephalographs of 110 Iraqi adults. Lateral conventional and digital cephalometric radiographs were taken for each subject, a hardcopy image from the digital cephalometric radiograph have been printed. Twenty one cephalometric measurements (12 angular and 9 linear measurements) were determined. Cephalometric analyses were made by traditional (manual), direct digital analysis by the Planmeca Software Program (Dimax) and direct manual analysis on the hardcopy image. The results showed that most of cephalometric landmarks have been identified with more precision and reliability within the digital techniques rather than with conventional and hardcopy techniques. With the hardcopy analysis technique, all the linear measurements either skeletal or dental showed a high significant variation, so it cannot be used to make the so good diagnosis or the evaluation of the treatment plan. On the other hand, there was no statistical significance difference between the conventional and digital methods and both techniques could be used as clinical tool in diagnosis and treatment planning evaluation.

Nowadays in Iraq, AutoCAD (Auto Computer Aided Design) program is the best solution. With this software, both digital and conventional X-rays, that can be scanned and entered to this program, can be analyzed. It has the property of measuring the angular, linear parameters and surface area. With it, the image is imported, the magnification is corrected and points and planes can be obtained easily with the property of enlarging the image, snapping the points, determination the mid between two points, drawing the perpendiculars, and measuring the variables with high precision.

Since 2005, AutoCAD program used in cephalometric analysis and no one test its reliability, so the aim of the present study is to evaluate the reliability of AutoCAD program in cephalometric analysis in comparison with Viewbox 3.1.1 cephalometric computer software.

MATERIALS AND METHOD

Sample

The sample consisted of 30 digital true lateral cephalometric radiographs of some under- and postgraduate students in the College of Dentistry/ University of Baghdad.

Equipment

a)Pentium IV portable computer.
b)Analyzing softwares (AutoCAD 2007 by Autodesk, Inc., and Viewbox 3.1.1 by Dhal Orthodontic Software).

Method

Cephalometric Analysis

Every digital true lateral cephalometric radiograph was analyzed by Viewbox 3.0.1 cephalometric computer software one time then by AutoCAD program 2007 on the second time to obtain the angular and linear measurements. After importing the picture to both of these programs, the magnification was corrected, the points were localized, the planes were determined, and the angles and distances were measured by the AutoCAD program while in Viewbox 3.0.1 software the planes and measurements were obtained directly as the program designed.

Cephalometric Landmarks, Planes, and Measurements

I. Cephalometric Landmarks

1. Point S (Sella): The midpoint of the hypophysial fossa [23].
2. Point N (Nasion): The most anterior point on the nasofrontal suture in the median plane [23].
3. Point Ar (Articulare): The point of intersection of the external dorsal contour of the mandibular condyle and the temporal bone [24].
4. Point A (Subspinale): The deepest midline point on the premaxilla between the Anterior Nasal Spine and Prosthion [25].
5. Point B (Supramentale): The deepest midline point on the mandible between Infradentale and Pogonion [25].
6. Point Pog (Pogonion): It is the most anterior point on the mandible in the midline [25].
7. Point ANS (Anterior Nasal Spine): It is the tip of the bony anterior nasal spine in the median plane [23].
8. Point PNS (Posterior Nasal Spine): This is a constructed radiological point, the intersection of a continuation of the anterior wall of the pterygopalatine fossa and the floor of the nose. It marks the dorsal limit of the maxilla [23].
9. Point Me (Menton): The lowest point on the symphyseal shadow of the mandible seen on a lateral cephalograms [26].
10. Point Go (Gonion): A point on the curvature of the angle of the mandible located by bisecting the angle formed by the lines tangent to the posterior ramus and inferior border of the mandible [26].
11. Point Ii (Incisor inferius): The tip of the crown of the most anterior mandibular central incisor [23].
12. Point Is (Incisor superius): The tip of the crown of the most anterior maxillary central incisor [23].
13. Point Ap 1 (Apicale 1): Root apex of the most anterior maxillary central incisor [23].
14. Point Ap 1 (Apicale 1): Root apex of the most anterior mandibular central incisor [23].

II. Cephalometric planes

1. Sella-Nasion (SN) plane: Formed by a line joining Sella turcica and Nasion [23].
2. S-Ar plane: Formed by a line joining Sella turcica and Articulare [23].
3. Ar-Go plane: A line joining Articulare to Gonion [23].
4. N-Pog plane: Formed by a line joining Nasion and point Pogonion [25].
5. N- A line: Formed by a line joining Nasion and point A [25].
6. N- B line: Formed by a line joining Nasion and point B [25].
7. Palatal plane: Formed by a line joining ANS and PNS [23].
8. Mandibular plane (MP): Formed by a line joining Gonion and Menton [23].
9. Long axis of the upper incisor (U1): A line connecting Is and Ap 1 [23].
10. Long axis of the lower incisor (L1): A line connecting Ii and Ap 1 [23].
11. Mandibular incisor- Mandibular plane: A line connecting the long axis of the lower incisor to the mandibular plane [23].
12. Maxillary incisor- Palatal plane: A line connecting the long axis of the upper incisor to the palatal plane [23].

Cephalometric measurements

A. Angular measurements

1. SNA angle: The angle between lines S-N and N-A. It represents the angular anteroposterior position of the maxilla to the cranial base [27,28].
2. SNB angle: The angle between lines S-Nand N-B. It represents the angular anteroposterior position of the mandible to the cranial base [27,28].
3. ANB angle: The angle between lines NA and N-B. It is the most commonly used measurement for appraising anteroposterior disharmony of the jaws [27,28].
4. Gonial angle (Ar-Go-Me): The angle between the posterior border of the ramus and the mandibular plane [23].
5. Saddle angle (N-S-Ar): The angle between the

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anterior and the posterior cranial base. This angle formed at the point of intersection of the S-N plane and the S-Ar plane [23].

6. Articular angle (S-Ar-Go): The angle between S-Ar and Ar-Go planes [23].
7. S-N-Pog angle: The angle between S-N and N-Pog planes [23].
8. SN-PP angle: The angle between S-N and palatal planes [23].
9. Maxillary incisor – Palatal plane angle (U1-PP): The angle between long axis of upper incisor and palatal plane, posteriorly [27,28].
10. Mandibular incisor– Mandibular plane angle (L1-MP): That angle formed by the long axis of the most labial mandibular incisor to the mandibular plane, posteriorly [24].
11. Inter-incisal angle (U1-L1): The angle formed by the intersection of the lines representing the long axes of the most labial maxillary and mandibular incisors, posteriorly [27,28].

B. Linear Measurements

1. S-N: A distance from Sella to Nasion [23].
2. S-Ar: A distance from Sella to Articulare [23].
3. Mandibular body length: It represents the distance from Gonion to Menton [23].
4. Ramus length: The distance between Ar and Go [23].
5. Total anterior facial height (TAFH): It's measured from N to Me [29].
6. Posterior facial height (PFH): It's measured from S to Go [29].

Statistical Analyses

All the data of the sample were subjected to computerized statistical analysis using SPSS version 15 (2006) computer program. The statistical analysis included:

1. Descriptive Statistics

a) Means.

b) Standard deviations (SD).

c) Statistical tables.

2. Inferential Statistics

a) Paired- samples t-test for the comparison between both methods.

In the statistical evaluation, the following levels of significance are used:

Non-significant	NS	$P > 0.05$
Significant	*	$0.05 \geq P > 0.01$
Highly significant	**	$0.01 \geq P > 0.001$
Very highly significant	***	$P \leq 0.001$

RESULTS AND DISCUSSION

Different studies had been made to compare between the manual and computerized cephalometric analysis revealed non-significant difference between the methods [6,13].

Baskin and Cisneros [14] conducted a study to determine the reliability and reproducibility of measurements obtained from two popular programs, Dentofacial Planner and Quick Ceph, as compared to manual tracings using the measurements of Steiner's analysis. They found that both Dentofacial Planner and Quick Ceph can produce dependable results.

The result of the present study revealed that the mean values of the measured variables by both softwares were very close with a non-significant difference between both methods (Table 1).

For both methods, the cephalometric analysis depended mainly on landmarks identification by the observer rather than the method of calculating and measuring of the linear or angular variables.

Although the results showed a non-significant difference between both softwares; the differences between them obviously seen in their design. Viewbox was designed as a cephalometric analysis program developed by an orthodontist. Initially it was written for personal computers in the DOS environment and later it was ported to Windows 3.1. Version 3.1.1 incorporates the latest in cephalometric analysis software, including advanced image processing algorithms, Procrustes superimposition and Principal Component Analysis, while AutoCAD program in fact designed for solving engineering purposes rather than orthodontic analysis. One of the most features in the AutoCAD program is that the observer has a full control in locating points that are between two shadows, like Gonion unlike preprogrammed identification by Viewbox 3.1.1 cephalometric computer software.

CONCLUSIONS

AutoCAD program, like Viewbox, is not restricted to cephalometric analyses, however, this program can perform measurements on any diagnostic record that can be scanned with a scanner or photographed with a video or digital camera. Such records might include frontal, submentovertex and panoramic radiographs, orthodontic models, facial and profile photographs,

hand-wrist radiographs, animal radiographs, etc. The results of the present study revealed non-significant difference between both methods. Therefore, Auto-CAD program can be used in clinical diagnosis also suited for research projects.

Table 1. Descriptive statistics and methods difference for the measured variables

Variables		Descriptive statistics				Method difference d.f.=29		
		Viewbox		AutoCAD				
		Mean	S.D.	Mean	S.D.	Mean difference	t-test	*p*-value
Angular Measurements (°)	SNA	82.67	3.25	82.83	3.17	0.17	1.37	0.19 (NS)
	SNB	79.44	3.15	79.50	2.98	0.06	0.44	0.67 (NS)
	ANB	3.33	1.33	3.28	1.41	-0.06	-0.44	0.67 (NS)
	GA	126.22	3.14	126.22	3.32	0	0	1 (NS)
	N-S-Ar	122.06	5.18	122.56	5.29	0.50	1.84	0.08 (NS)
	S-Ar-Go	144.50	5.89	143.94	5.92	-0.56	-1.82	0.09 (NS)
	SN-PP	9.28	2.44	9.17	2.20	-0.11	-0.52	0.61 (NS)
	S-N-Pog	80.44	3.01	80.39	3.01	-0.06	-0.37	0.72 (NS)
	U1-PP	111.11	8.78	110.83	8.54	-0.28	-0.77	0.45 (NS)
	L1-MP	100.39	6.48	100.61	7.20	0.22	0.44	0.67 (NS)
	U1-L1	124.83	10.72	125.39	10.85	0.56	1.25	0.23 (NS)
Linear Measurements (mm)	S-N	67.89	2.64	68.32	3.03	0.42	1.26	0.23 (NS)
	S-Ar	33.08	2.94	33.31	2.94	0.23	1.82	0.09 (NS)
	Go-Me	68.22	2.89	68.73	3.03	0.50	1.24	0.23 (NS)
	Ar-Go	45.21	6.22	45.42	6.12	0.21	1.34	0.20 (NS)
	TAFH	113.02	7.29	113.14	7.17	0.12	0.75	0.46 (NS)
	PFH	74.73	6.62	74.87	6.54	0.14	1.76	0.10 (NS)

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Assessment of some salivary biochemical parameters in cigarette smokers with chronic periodontitis

Mahmood Y.Gazy
Ahmed B.Mohiaddin
Al-Kasab Z.Ahmed

Abstract

Background and objectives: Cigarette smoking is an important risk factor that has a clear strong association with the prevalence and severity of chronic periodontitis (CP). Salivary biochemical parameters may be affected by both smoking and CP together.

Method: Eighty systematically healthy male, were included in this study. They were grouped based on their periodontal and smoking status. Unstimulated whole saliva (UWS) was collected from all subject. Salivary flow rate (FR) was measured during sample collection. Parameters such as salivary pH, total protein (TP), albumin (Alb), globulin (Glo), total fucose (TF), protein bound fucose (PBF) and C-reactive protein (CRP) were estimated.

Results: Salivary flow rate was not altered regarding to periodontal health status. Salivary pH was lower in smokers than in non-smokers, while it was not affected by periodontal health status. TP, Alb and Alb/Glo ratio were higher in CP patients. Saliva Glo and TF levels increased in both CP and smokers with CP, while salivary PBF level decreased in both CP and smokers with CP comparing to healthy control. The concentrations of these parameters did not affect by smoking status except for TP. Regarding CRP, in general, its level was higher in smokers than in non- smokers, while it was not affected by periodontal health status.

Conclusion: Both smoking and chronic periodontitis together affect some salivary biochemical parameters, thus the concentrations of these parameters could be used as indicators for periodontal disease progression and severity in smokers with CP. Both smoking and periodontal health status together should be taken in consideration when salivary composition is studied.

Key words: Salivary biochemical compositions, Saliva, Smokers, Chronic Periodontitis, salivary flow rate, salivary glycoproteins, salivary fucose.

Introduction

Chronic periodontitis (CP) can be defined as an infectious disease that, results in inflammation within supporting structure of the tooth, progressive attachment loss, and bone loss[1]. Advanced form of the disease affects about 10% - 15% of adult population worldwide[2]. Although, its occurrence normally involved adult individual, chronic periodontitis can appear at any age[3].

Periodontitis are considered as an outcome of an imbalance in the host parasite interaction. Although the microbial etiology of periodontitis is well established, the extent and severity of the disease depend upon the interaction between pathogenic bacteria challenge and host response [4, 5]. In the presence of systemic or environmental factors, which may modify the host response to plaque accumulation, such as; diabetes, smoking or stress, the disease progression may become more aggressive[6].

Smoking is very strong behavioral risk factor for CP. Cigarette smokers are 2.5 - 6 times more likely to develop CP than non-smokers[7]. Chronic periodontitis is more prevalent and more severe in smokers, characterized by deeper periodontal pockets, greater attachment loss and more fraction defects. Smoking is considered as an independent risk factor for periodontitis[8].

The precise mechanisms whereby cigarette smoking can exert an effect on periodontal tissues are not completely understood, it is clear that it is still the most significant preventable risk factor for CP. Its effects are related to the duration and number of cigarettes consumed [9, 10].

The diagnosis of periodontal disease usually accomplished through clinical periodontal parameters including plague index, calculus index, periodontal pocket depth, bleeding index and clinical attachment loss (CAL) [11].

Saliva plays an important role in the protection of periodontium. It also affected by smoking[12, 13]. Analysis of saliva can be contributed in the periodontal disease diagnosis[14].Saliva can be easily collected, it contained locally derived and systemically derived markers of periodontal diseases [15], However, their exact value or the optimal markers combination has not been defined [16,17]. Furthermore, the analysis of saliva may be offer a cost-effective approach to assess periodontal disease incidence in large population [14].

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The purpose of this study was to analysis some salivary parameters in smokers with CP. Most studies, done on salivary compositions in chronic periodontitis patient, excluded smoker as it might affect the salivary compositions. Little information is available on salivary compositions in smokers with chronic periodontitis patients, while no study was found included Kurdistan population.

Subjects and methods

Subjects

Eighty systematically healthy male (their age ranged between (30-60) years) were enrolled in the study. They were subdivided into four equal groups: Non-smokers with clinically healthy periodontium (GI), Smokers with clinically healthy periodontum (GII), Non-smoker with CP (GIII) and Smoker with CP (GIV). Chronic periodontitis was defined as a patient who had two or more interproximal sites with CAL of 4mm or more (not in the same tooth), while clinically healthy periodontium was defined as subjects with mean bleeding on probing index (BOP) ≤ than 0.11 and they had no CAL[18] .

Exclusion criteria: cardiovascular disease, diabetes mellitus, hypertension, liver disease, endocrine disorders, immunodeficiency diseases, subjects had less than 20 teeth retained in their mouth, former smokers, alcohol drinkers, patients on medical treatment or had history of pervious periodontal therapy, were excluded.

The clinical periodontal examinations used in this study were periodontal Pocket depth (PD), CAL, BOP, plaque index (PI), Calculus index (CI), in four surfaces of all tooth[6, 19].

Periodontal tissue destruction was determined by CAL which was measured from cementoenamel junction to the base of the periodontal pocket (Varma and Nyake, 2009).Periodontal pocket depth was measured from gingival margin to the base of the periodontal pocket [20].

Severity of PD and CAL was estimated (total PD /CAL divided by affected surfaces) and extension of PD and CAL was calculated (number of affected tooth surfaces divided by total tooth surfaces) [11].

Personal information was collected by including social and behavioral factors such as age, address, smoking status {measured by Pack year (PY); number of cigarette smoked in a day multiplied by number of years of smoking} and tooth brushing frequency (TBF).

Saliva collection

Unstimulated saliva samples were collected from all subjects in the morning (9 -11 a.m.), in order to minimize the effect of diurnal variation on flow and composition [21].Spitting method was used for collecting unstimulated whole saliva (UWS) [22]. All subjects instructed to brush their teeth and refrained from drinking, eating or smoking two hour before saliva collection. Subjects was asked to rinse the mouth with distilled water for three minute to remove any food debris ,then 10 minutes later, all subjects was directed to accumulate saliva in their mouth until the desire to swallow occurred, then they spitted saliva into a sterilized graduated plastic test tube until four to five milliliter of saliva was collected (Flink,2005). Any blood contaminated saliva was discarded. The samples were centrifuged for ten minutes at 3000 r.p.m.[23].

Laboratory methods

Unstimulated salivary flow rate was defined as the total volume of saliva produced per unit time (ml/mint) [24]. The pH values of the saliva were immediately measured by using pH meter. Afterward, saliva samples were stored at (-20°C) until analysis[23].

Salivary total protein concentration was estimated using biuret reaction. Salivary albumin concentration was estimated using Bromocresol green method. Salivary globulin concentration (Glo) was estimated by subtracting salivary albumin concentration from salivary total protein[25], then albumin/ globulin ratio (Alb/Glo) was calculated. Salivary total fucose (TF) and salivary protein bound fucose (PBF) were determined by using Dische and Sheetels method cited in Al-Sarrag[26]. The estimation of CRP was performed by Latex slide agglutination method (Qualitative Measurement) recorded as a negative or positive results[25].

Statistical analysis

The study variables were statistically analyzed using Post Hoc test, t-test and Pearson Chi-Squar.

Results

Table (1) shows the mean ± SD (stander deviation) for all the parameters which have been measured in this study, while table (2) shows statistically significance differences among the groups. There was a sta-

tistically significant difference (p>.001) in smoking exposure measured in PK in GII compared to GIV. GII had lower smoking exposure in their life time than GIV.

Regarding flow rate (FR), non significant changes were observed among the groups.

There was a statistically significant decrease in the salivary pH in both GII and GIV when compared to GI. In general smokers had lower salivary pH than non-smokers. No change in pH value was found in GIII.

Regarding salivary TP, increase in its mean value was seen in GII, GIII, and GIV when compared with GI. The results showed that there was a high significant increase in the salivary albumin in GIII when compared to GI, GII and GIV (p> 0.001). Non-significant differences between GI and GII and between GI and GIV were observed.

There was a statistically significant increase in the salivary globulin in both GIII and GIV when compared to GI (p> 0.05). Non-significant differences between GII and GI and between GIII and GIV were seen.

The result indicated a statistically significant increase in the ratio of salivary albumin to globulin in GIII when compared to GI, GII and GIV (p> 0.05). Non-significant differences among GII, GIV and GI were seen. GII had the lowest mean value.

There was a high significant increase in the salivary TF in both GIII and GIV when compared to GI (p> 0.001). Patient with CP had higher salivary TF concentration than subjects with clinically healthy periodontium.

The result showed a high significant decrease in the salivary PBF in both GIII and GIV when compared to GI. There was also a highly significant decrease in the salivary PBF in both GIII and GIV comparing to GII (p> 0.001), while a non-significant difference between GI and GII and between GIII and GIV was found. Patient with CP had lower PBF concentration than subjects with clinically healthy periodontium.

There was a statistically significant increase in salivary CRP in GII comparing to GI and GIII, while a significant increase was found in GIV comparing to GI and GIII (p> 0.05). Non significant differences between GII and GIV and between GIII and GI were observed. In general smoker groups had significantly higher salivary CRP than non- smoker groups (figure 1).

Discussion

In this study, the results showed that there was a high significant difference in smoking exposure in term of PY between GII and GIV. This result is indicated that there is a dose response relationship between smoking and periodontal health status.

In the present study, there were statistically non significant differences in UWS flow rate among the groups. This result was in agreement with other studies[27- 31], who found that UWS flow rate was not affected by periodontal health status, while the result showed a disagreement with Sculley and Langley-Evans, who found that UWS flow rate significantly increased in severe CP[32]. The result also was in disagreement with Aziz and Askari, who observed that UWS flow rate was significantly lower in smokers compared with non-smoker[33].

In this work, there was a statistically significance decrease in salivary pH in smokers when compared with non smokers. This result was in agreement with some authers[27, 28], while it was in disagreement with Gonzaalez et al[34]. This disagreement might be resulted from using low sample numbers in their studies. Low salivary pH value in smokers comparing to non smokers might be due to the acidity effect of cigarette smoke components that may be dissolved in saliva. There was a non significant difference in pH values between patient with CP and subjects with clinically healthy periodontium. This result was in line with some other studies[33, 35], while the result was in disagreement with Bezerra-Junior et al, who found that salivary pH value was higher in CP patient comparing to control[29].

According to the results of this work, patients with CP had higher salivary total protein concentration than clinically healthy subjects. This result might be due to periodontal tissue destruction, thus releasing of periodontal proteins into oral cavity. Smoking had statistically non significant effect on salivary TP.

The result showed that there was a high significant increase in salivary albumin concentration in GIII, comparing to the other groups. The high albumin

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level in CP patients may be due to periodontal tissue destruction, bleeding status, bacteria growth and/or ulceration in sulcular epithila [36]. In this study, it was also found that, smokers with CP had lower salivary albumin concentration compared with non smokers with CP. This result might be due to the thickening of the basement membrane in blood vessels, so reducing gingival blood flow in smokers compared with non smokers[37].

In the present study, there was a statistically significant increase in salivary globulin concentration in GIII and GIV comparing to GI, while a statistically no significant difference was found among the other groups. This result might be due to the increase in inflammatory proteins infiltrated through sulculer epithelia into gingival sulcus, then into saliva in CP patients6, whereas the inflammatory proteins will decrease in saliva of smokers[38, 39].

The result showed that, salivary albumin /globulin ratio was statistically higher in GIII when compared with the other groups. This result might be due to higher salivary albumin levels in non smokers with CP compared with the other groups.

According to this study, salivary TF was increased, while salivary PBF decreased in patients with CP compared with clinically healthy groups. This result might be due to periodontal tissue destruction in CP and increase in glycosidase activity, which is responsible for glycoprotein degradation[37]. The results showed that cigarette smoking has no significant influence on salivary TF and PBF levels.

In the present study, smokers had higher salivary CRP value than non smokers, while salivary CRP value was not altered in periodontal health status. This result indicated that smoking has more effect on salivary CRP than CP.

Conclusions

Smoking, CP, and both smoking and Cp in combination can affect the chemical components of saliva; mostly proteins, glycoprotiens and their related parameters. Some of these salivary components may be used as indicators in the diagnosis and prognosis of CP and smokers with CP. It is necessary that, both periodontal health and smoking status be considered during study of salivary composition.

Table (1): The mean ± SD values of all the parameters in saliva of the groups

Parameters	GI	GII	GIII	GIV
SH (PK)	_	254 ± 202.7	_	642.5 ± 411.4
BOP	0.087 ± 0.0575	0.061 ±0.0655	0.9945 ± 0.708	0.5795 ± 0.931
CI	0.3525 ± 0.4078	0.584 ± 0.735	1.4675 ± 0.911	1.7135.± 1.023
PI	1.289 ± 0.845	1.6275 ± 0.871	2.0735 ± 0.663	2.2745 ± 0.931
CAL (severity)	_	_	5.0535 ± 0.584	5.126 ± 0.8749
CAL(extension)	_	_	0.306 ± 0.214	0.560 ± 0.412
PD (severity)	_	_	4.735 ± 0.151	4.9 ± 0.32
PD (extension)	_	_	0.135 ± 0.036	0.311 ± 0.078
FR (ml/min)	0.61 ± 0.452	0.83 ± 0.5	0.54 ± 0.376	0.61 ± 0.37
pH	7.498 ± 0.51	7.17 ± 0.4	7.492 ± 0.25	7.07 ± 0.63
TP (mg/dl)	178.1 ± 13.97	224.65 ± 20.62	270.2 ± 93.7	248.1 ± 76.9
Alb (mg/dl)	21.56 ± 8.61	21.55 ± 8.69	48.2 ±13.27	27.67± 4.87
Glo (mg/dl)	116.4 ± 61.97	202.4 ± 86.7	221 ± 90.3	220.4 ±76.9
Alb/Glo	0.1563 ± 0.0936	0.1622 ± 0.2402	0.2785 ± 0.1936	0.1489 ± 0.1635
TF (mg/dl)	11.67 ± 4.164	14.37 ± 3.51	18.73 ± 4.24	20.95 ± 5.17
FBP (mg/dl)	3.793 ± 0.193	3.813 ± 0.193	2.368 ± 0.43	2.342 ± 0.55

Table (2):-Statistically significances for the salivary parameters among the groups.

Parameters	GI-GII	GI-GIII	GI-GIV	GII-GIII	GII-GIV	GIII-GIV
SH (PK)	_	_	_	.0001**	_	_
TBF	.150	022*	.045*	.791_	.919	.755
BOP	.884	_	_	_	_	.022*
CI	.365	.0001**	.0001**	.001**	.0001**	.336
PI	.203	.004*	.0001**	.095	.016*	.448
CAL (severity)	_	_	_	_	.664	_
CAL(extension)	_	_	_	_	.017*	_
PD (severity)	_	_	_	_	.647	_
PD (extension)	_	_	_	_	.220	_
FR	.872	.198	.291	.248	.370	.794
pH	.030*	.968	.005*	.033*	.506	.006*
Alb	. 819	.0001**	.212	.0001**	.307	.0001**
TP	. 069	.001**	.005*	.162	.483	.414
Glo	. 076	.021*	.012*	. 57	. 563	.941
Alb/Glo	. 917	.036*	.897	.045*	.816	.026*
TF	.052	.0001**	.0001**	.002*	.0001**	.108
PBF	. 648	.0001**	.0001**	.0001**	.0001**	.948
CRP	.028*	.846	.006*	.028*	.526	.006*

(*) mean that there were significant differences between groups at p>0.05.
(**) mean that there were highly significant differences between groups .

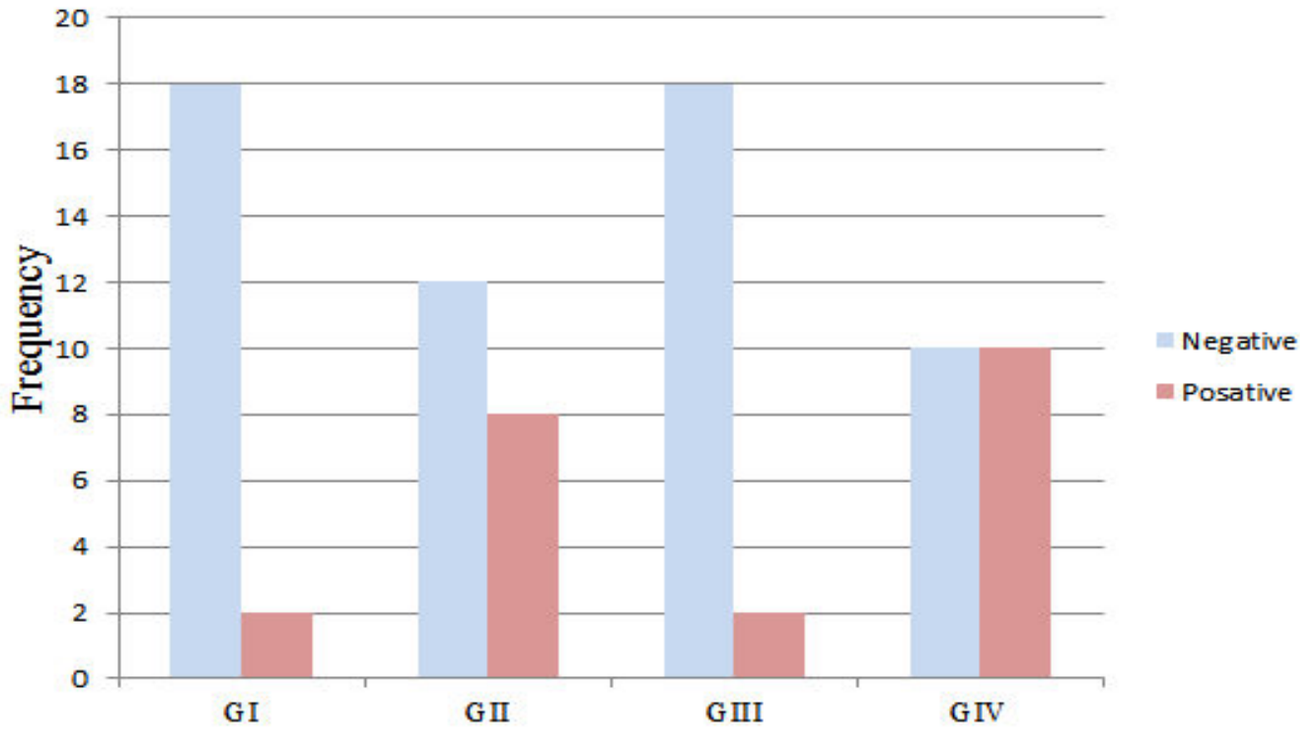

Figure (1): Salivary CRP values in all groups; GI, GII, GIII, GIV

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The Effect of Augmentin as Adjunctive therapy in the Treatment of Aggressive Periodontitis

Ala'a Omran. B.D.S., M.Sc.
Periodontics Dept, College of Dentistry, University of Baghdad.

ABSTRACT

This research was conducted to investigate the effect of combined therapy of systemic Augmentin , compared to conventional periodontal treatment on clinical parameters of periodontal health and subgingival microflora- Thirty patients have aggressive periodontitis were examined and divided to control (15 patients), and test group (15 patients). The results revealed that, using antibiotics in periodontal treatment suppress the relative proportion of subgibgival microflora and decreases the mean probing pocket depth, gingival index if compared to base line values.

INTRODUCTION

It is well known that dental plaque plays a major role in periodontal disease, and periodontitis is the result of an interaction between bacterial plaque with it's products and the resultant inflammatory and immunological changes within the periodontal tissues. The recognition, that destructive periodontal disease may be caused by specific micro-organism, has led to an increased interest and usage of anti¬microbial agents (ABS) alone or as an adjuncts in periodontal therapy [9]. Their therapeutic success could be attributed to their ability to eliminate the bacteria that escaped root planing [6], or those that infiltrate the adjacent connective tissue [7]. Amoxicillin (AMO) in particular has been used for this purpose, on the other hand Metronidazole (MET) has a specific action against anaerobic bacteria. Combination as AMO + MET produces a synergistic effect against most of periodontal pathogen as Actinobacillus Actinomycetem comitans (Aa) [4]. This research was carried out to:

1-Determine the effect of a combined therapy of systemic AMO+MET on the microfloras as subgingival plaque.

2-Compare the effectiveness of combination periodontal therapy, i.e. scaling and root planing and the same plus combined MET, AMO on the following clinical parameters: probing depth & the gingival index.

MATERIALS AND METHODS

Thirty patients with aggressive periodontitis were selected, using the criteria of page and Schroeder (1983) from the Dental Polly-clinic. College of Dentistry, University of Baghdad.

The Patient age ranged between 25-30 years, all subjects were healthy, none had antibiotic therapy for one month prior to the commencement of the study and they should possess a minimum of two multi rooted teeth and three signal rooted teeth in every quadrant, these teeth and should exhibit pocket of <=5mm pregnant women were excluded from this study. The sample was equally divided one group served as an experimental group, i.e. receiving the antibiotic therapy plus the conventional treatment only. The allocation of the subjects was randomly performed.

Experimental Design: Prior to the study each individual was motivated and instructed in oral hygiene measures, plaque was measured using the plaque index pi .1 [8], till mean reached 0.5 , then the subject is included in the study and allocated either to the control or experimental group.

At this stage each subject had a clinical examination in which the following clinical parameters were recorded, this is regarded as base line data: -

a) Gingival index GI.I [2].

b) Probing pocket depth (PPD) to the nearest millimeter at each site.

The same parameters were recorded at the end of each two weeks in another word there were 4 clinical recording, with two week in between each.

Plaque Sample:

At the base line and at the end of two months, samples (from three approximal sites) of sub gingival plaque were taken, the deepest pockets were selected. After removal of supra gingival plaque, the sites were isolated from saliva by the application of cotton rolls and were gently dried with compressed air [5]. Three sterile medium paper points were transferred into a screw capped vial containing thioglycolate medium. After doing scaling and root planing the subjects of the test group were instructed to take augmentin capsule 625mg/three times daily for one week.

Culture technique:

Thioglycolate broth were incubated in an anaerobic jar or Gaspack Jar [12], for 48 h at 37°C and tested by taking a smear that was stained on a slide to reveal types and relative number of micro-organisms present. The cultures were also done on trypticase soy agar plates supplemented with 5% human blood and incubated an-aerobically for 48 h at 37°C. The plates were examined with a hand lens (8x), and a colony description was recorded, this include: size, shape, edge, profile, color, opacity, haemolysis, pigments, catalase, indol test, antibiotic sensitivity; 20% Bile test, urease, nitrate, sugars fermentation, gelatin liquefaction, milk reaction and Esculin hydrolysis.

RESULTS

Clinical parameters:

The results of the effect of the treatment on clinical parameters revealed that, a non significant decrease was noted in the mean PPD for the test group at the Ia,2nd&3fd visits compared to the base line values, but the significant difference was noted at the last visit (table 1) $p<0.05$ using t-test. While for the control group a non- significant difference was noted on PPD at all recall visits compared to base line value using I* test (table 2). In respect to the G.I when the test group and the control group was compared a decrease in the mean G.I was noted. This proved to be significant [$p<0.05$] (table 3).

Table 1: The mean PPD for the test group.

Visits	Probing pocket depth				
	4	6	8	= 10	X±S.D
Base line	34	71	88	32	56 ±27
2nd visit	66	64	70	25	56 ±20
3rd visit	79	63	63	20	56 ±25
4th visit	98	82	40	5	68 ±26*

* significant difference $p<0.05$

Table (2) The mean PPD for the test group.

Visits	Probing pocket depth				
	4	6	8	*10	XiS.D
Base line	35	77	82	31	56 ±26
2nd visit	49	71	80	25	56 ±24
3rd visit	53	69	78	25	56 ±23
4* visit	51	63	84	26	68 ±23

Table 3: Difference in mean G.I between test & control group at all recall visits

Visits	Test group	Control group
Base line	2.5	2.9
VI	2.45	2.6
V2	1.9	2.4
V3	1.5	1.96
V4	0.5	1-7
X±S.D	1.78 ±0.7	2.36 * 0.4*

* significant difference V = visits

Culture data:

Table (4) describes the types of bacteria isolated from the two cultures in the test and control groups, these types, are expressed as percentage. From this table a general decrease in all types of bacteria was seen in both the test and the control groups, however, this decrease is more obvious in the control group.

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Table 4: Percentage proportion of subgingival microflora before anil after treatment.

Type of bacteria	Test group		Control Group	
	1st culture	2nd culture	1st culture	2nd culture
B.Fragilis	26%	13%	40%	33%
B.Melaninogenicus	13%		13%	6%
Fuso bact.	6%		20%	
Actinomyces	6%		6%	
Pepto Coccus	20%	6%	13%	
Veillonella	20%	6%	6%	
Candida	6%	6%		

DISCUSSION

The use of Augmentin in this research protocol used as adjunctive therapy in addition to conventional, non-surgical treatment of periodontal disease seems to have a profound influence on PPD seen at the end of the experimental period, (his is in agreement with Van Winkelhoff ct al. 1989, and Pavicic et al. 1999. These investigators, correlated this improvement with the elimination or reduction in A. a. In our study A. a was not isolated, for this reason definitive comparison is not feasible.

The decrease in clinical parameters of the test group also may be due to the synergistic effect of Augmentin and that some bacteria have the ability to invade the adjacent connective tissues, so the antibiotics reach these sites. The combined treatment of scaling, root planing and antibiotics cause a significant decrease in G.l for the test group and this could be attributed to a good control of subragingival plaque through both self performed oral hygiene measure, and this in agreement with the finding of Tagge et al. 1975, Ismail 1996. It will remain to determine if the organisms that were mostly affected by the antibiotic therapy namely B.Fragilis & B.Melaninogenicus, that were reduced by 50% do carry an important pathologic potential. Some of the organisms did not show any variation, when cultured from sites that were taken from test patients or the control. The significance of such organisms is difficult to establish especially when one is dealing with a mixed flora and complicated by a variety of factors such as present in plaque.

Indeed this research is not designed to answer this question. In conclusion from our results: it appears that Augmentin therapy has a beneficial effect, at least for a limited period of time.

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Dental Treatments during full mouth rehabilitation under General Anesthesia in Healthy and special needs pediatric dental patients in Baghdad, Iraq.

Sami Malik Abdulhameed; B.D.S.; M.Sc; & Certificate Pediatric Dentistry Speciality
Department of Pediatric Dentistry and prevention, College of Dentistry, Baghdad University.

ABSTRACT

Dental treatments under general anesthesia (GA) in healthy and disabled children are rarely reported. This retrospective study evaluated the characteristics and treatment modalities performed under general anesthesia in pediatric dental patients at Baghdad Private Hospitals, and compared the different treatment patterns performed in healthy children and children with special health care needs.

The data were reviewed in pediatric patients from 1 to 18 years old who underwent dental treatment performed under general anesthesia from January 1990 to December 2011. Patients with special health care needs who had at least one type of mental or physical disability were assigned to the disabled group (Group A) and the other healthy patients were assigned to the healthy group (Group B). The treatment modalities of operative restoration, crowns, pulp therapy, sealant and extracted teeth were compared in the two groups.

A total of 105 patients were assigned to group B and 80 to group A. The patients in group A were significantly older than those in group B. There were no significant differences in the mean number of teeth treated between the two groups. However, there was a significantly greater mean total number of teeth extracted in group A patients ($p < 0.001$). In addition, there were more stainless steel crown reconstructions ($p < 0.05$) and pulp therapies ($p < 0.001$) performed in group B patients. In group A, there were no significant differences in the total number of teeth extracted between the 1-3 year old patients and the 3-6 year-old patients ($p = 0.99$). For very young children or those with special health care needs, dental treatment performed under general anesthesia is beneficial and efficient. The findings of this study suggest that underlying medical or mental conditions may influence the dental condition and treatment modality provided.

Key words: dental care, disabled, general anesthesia, dental treatment, teeth extracted

Introduction

Pediatric Dentist provide oral care and solve problems for infants, children and adolescents and young persons with special care needs. The majority of children can be adequately treated with Non pharmacologic behavior modification techniques such as the tell-show-do technique. However, some children who have extensive dental problems cannot cooperate due to a lack of psychological or emotion- al maturity and/or mental, physical or medical dis- abilities, and their dental treatment needs to be com- pelted with pharmacological behavior management, such as nitrous oxide/oxygen sedation or general anesthesia.[1-4]

Since 1988, comprehensive dental treatment under general anesthesia has been provided for many patients in the operating room at Baghdad Private Hospitals. These patients consisted of a certain percentage of healthy children with substantial dental needs who were extremely uncooperative or uncommunicative with no expectation that the behavior would soon improve. Other patients with certain physical, mental, or medically compromised conditions were possibly unable to tolerate treatment under local anesthesia alone or together with inhale- tin sedation. Dental treatment performed under gen- earl anesthesia allows a total oral rehabilitation in a single course, including a full mouth prophylaxis treatment, operative dental restoration, pulp therapy, tooth extraction, stainless steel crown reconstruction, and preventive resin restoration.

The purposes of this retrospective study were first, to evaluate the characteristics and treatment modalities under general anesthesia in pediatric den- tall patients in these hospitals between 1990 and 2011, and second, to compare the different treatment patterns between healthy children and children with special health care needs.

SUBJECTS AND METHODS

The database for this study involved all patients treated under general anesthesia in the Baghdad Private Hospitals from January 1990 to December 2011.All 185 patients received dental and anesthetic preoperative assessments. Dental assessment included a dental and medical history, clinical examination, oral radiographs and appropriate hematological tests. A provisional treatment plan for each patient was formulated and advice on prevention was given to the parents. A consultant anesthesiologists made an assessment of the patient's suitability for general anesthesia and commented on any precautions to be taken. On the day of the operation, the treatment plan was finalized and consent was obtained. Most dental treat-

ments were carried out under general anesthesia with nasoendotracheal intubation. A very small num- ber of patients with limited mouth opening capability or other conditions received oral intubation. All den- tal treatments were performed by one Pediatric Dentist. Unless there were other adverse conditions, the patient was discharged one hour after recovery.

The data from their personal profiles were retrospectively reviewed, including general history, dental history, reasons for general anesthesia and treatment modalities, such as the number of restorative primary teeth, and restorative permanent teeth, which were the total number of teeth undergoing operative restoration, stainless steel crowns and sealant procedures. If the tooth was treated with preventive resin, we assigned it to the operative restored tooth group. We also recorded the number of pulp treated primary teeth, pulp treated permanent teeth, extracted primary teeth, and extracted permanent teeth, which included supernumerary teeth.

Patients were divided into two groups; those with special health care needs who had at least one type of mental or physical disability were assigned to the disabled group (group A) and those with neither mental nor physical disabilities were included in the healthy group (group B).

The data were recorded and analyzed using a two-sample t-test,with $p < 0.05$ indicating signifi- cance.

RESULTS

There was a total of 105 patients in the database. patients were assigned to Group B and 80 to Group A. The age of the patients studied ranged from 1year 7 months to 17 years 10 months. For group B, the age distribution was 1 year 7 months to 12 years 1 month and the average age was 3.6 years, while that in group A was 2 years 3 months to 17 years 10 months and the average age was 7.2 years.

The patients in group A were significantly older than those in group B ($p < 0.001$). The Fig. 1 shows the age distribution in both groups.

. The boy to girl ratios in group B and A were 1.7 to 1 and 1.9 to 1, respectively. Most patients in group A were special needs patients. The two major underlying problems were mental retardation (36.6%) and

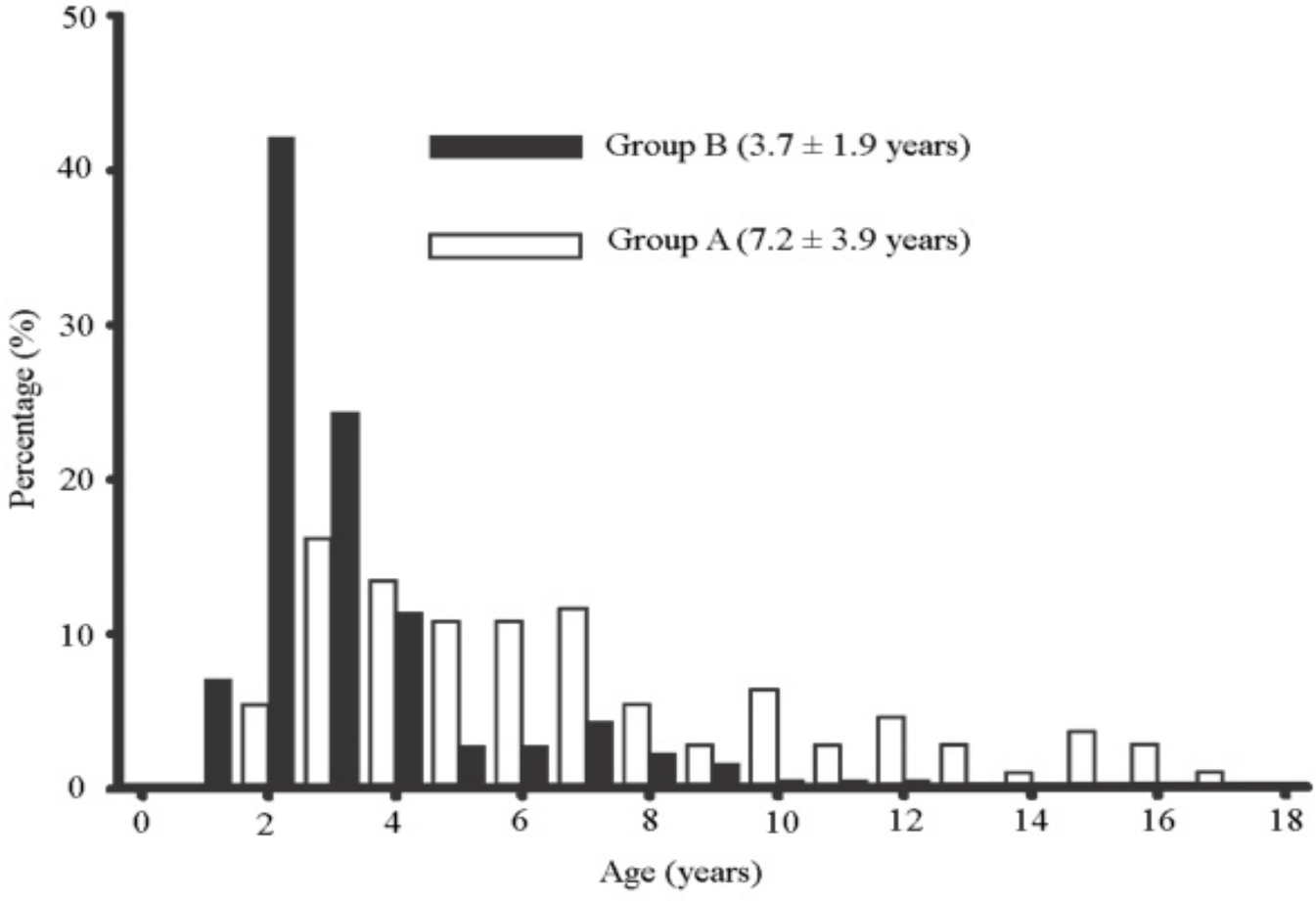

Fig. 1 Age distribution of the healthy (B) and disabled (A) groups. The patients in group A were significantly older than those in group B (7.2 3.9 y/o vs 3.7 1.9 y/o, $p < 0.001$).

autism (29.5%). Other problems includ- ed cerebral palsy (14.3%), developmental delays (8.9%) and epilepsy (6.3%).

Treatment modalities

The treatment modalities and specific number of treated teeth in both groups are shown in Table 1. The mean numbers of teeth treated in group B and group A were 13.2 and 13.6, respectively. There were no significant differences in the total number of teeth treated between groups.

The mean number of extracted teeth was significantly greater in group A patients for both primary and permanent teeth. Although there was no significant difference in the total number of restored teeth, there were more primary teeth restored than permanent teeth treated in group B patients. Also, there were no significant differences in the number of teeth receiving operative restoration and sealant procedures. However, there were more stainless steel crowns and pulp therapies performed in group B patients.

The majority of patients were 1~6 years old. Table 2 demonstrates the treatment pattern in patients who were younger than 6 years old. There were 85patients in group B and 32 patients in group A in this age group. There were no significant differences in the mean number of stainless steel crowns, pulp ther- apies, sealant procedures and total teeth treated between the two groups. Group A patients had sig- nificantly more extractions and fewer restoration treatments, especially operative treatments, than Group B patients.

In the group between 6 and 12 years old, there were 21 patients in group B and 43 patients in group A. Extractions of supernumerary or impacted teeth were performed in 20 of 21 group B patients, but in only 4 of 43 group A patients. The mean numbers of teeth treated for most modalities were greater in group A, except for the total number of permanent teeth extracted (p = 0.553) and the mean number of teeth treated by a sealant procedure (p = 0.453).

In the group between 12 to 18 years old, there were 25 patients assigned to group A, but only one to group B. That patient received dental treatment under general anesthesia for extraction of an impact- ed supernumerary tooth. A descriptive sample of these two groups was not included in the analysis.

Table 3 shows the mean number of teeth treated with various modalities between patients from 1 to 3 years old and 3 to 6 years old in both groups. In group A, there were no significant differences in the number of teeth treated by any of the treatment modalities in these 2 age groups. However, in group B, the 3-6 year-olds had more total teeth extracted and more stainless steel crowns than 1-3 year-olds group. Furthermore, the patients between 1~3 years old in group B had more operative restorations than did those between 3~6 years old. There were no sig- nificant differences for the other treatment modali- ties, such as pulp treatments, sealants, total number of restored teeth and treated teeth, between these two age groups in group A.

Table 1. Dental Treatment in Healthy (B) and Disabled (A) Patients from 1~18 Years Old

	Group B (n = 105)	Group A (n = 80)	p value
Operative restoration	7.9 ± 4.3	7.9 ± 4.7	0.95
Crown	4.3 ± 3.0	3.6 ± 2.9	0.04
Pulp therapy	5.6 ± 3.7	3.9 ± 3.4	< 0.001
Sealant	0.2 ± 0.9	0.2 ± 0.8	0.91
Total number of teeth restored			
Primary teeth	12.4 ± 5.8	7.9 ± 5.8	< 0.001
Permanent teeth	0.1 ± 0.5	3.8 ± 5.7	< 0.001
All teeth	12.5±5.7	11.7 ± 4.2	0.17
Total number of teeth extracted			
Primary teeth	0.7 ± 1.5	1.6 ± 2.7	0.001
Permanent teeth	0.0 + 0.1	0.2 ± 0.7	0.005
All teeth	0.7 ±1.5	1.9 ± 2.8	< 0.001
Total number of teeth treated	13.2 ± 5.7	13.6 ± 4.2	0.53

Data are presented as the mean ±SD

Table 2. Dental Treatment in Healthy (B) and Disabled (A) Patients from 1~6 Years Old

	Group B (n = 85)	Group A (n = 32)	*p* value
Operative restoration	8.8 ± 3.7	7.1 ± 3.7	0.005
Crown	5.0 ± 2.7	5.1 ± 2.7	0.68
Pulp therapy	6.4 ± 3.4	5.6 ± 3.8	0.19
Sealant	0.2 ± 1.0	0.1 ± 0.5	0.38
Total number of teeth restored			
Primary teeth	14.0 ± 4.1	12.3 ± 3.9	0.008
Permanent teeth	0	0.01 + 0.4	0.09
All teeth	14.0 ± 4.1	12.4 ± 3.9	0.01
Total number of teeth extracted			
Primary teeth	0.7 ± 1.6	1.9 ± 3.4	0.03
Permanent teeth	0.0 + 0.1	0	0.57
All teeth	0.7 ± 1.6	1.9 ± 3.4	0.03
Total number of teeth treated	14.7 ± 4.2	14.2 ± 3.8	0.45

Data are presented as the mean ±SD

Table 3. Dental Treatment in Healthy (B) and Disabled (A) Patients 1~3 Years and 3~6 Years Old

	Group B			Group A		
	1~3 y/o n = 54	3~6 y/o n =31	*p* value	1~3 y/o n = 8	3~6 y/o n =24	*p* value
Operative restoration	9.5±3.3	7.9±3.9	0.02	6.0 ± 3.0	7.3±3.7	0.77
Crown	4.3±2.6	5.7±2.6	0.004	6.2±2.7	4.9±2.7	0.41
Pulp therapy	6.0±2.8	6.7±3.9	0.39	7.2±4.0	5.3±3.7	0.25
Sealant	0.3±1.1	0.1±0.6	0.56	0	0.1±0.5	0.92
Total number of teeth restored	14.2±3.9	13.7±4.2	0.79	12.2±3.8	12.4±3.9	0.99
Total number of teeth extracted	0.3±0.8	1.2±2.1	< 0.001	1.7±2.4	1.8±3.6	0.99
Total number of teeth treated	14.5±4.0	15.0±4.3	0.73	14.0±4.5	14.2±3.7	0.99

Data are presented as the mean ±SD

DISCUSSION

Dental treatment performed under general anes- thesia in a hospital environment provides great effi- cacy and safety for particular groups of patients, such as very young or disabled children.(3,5-7) In our study, 105 young healthy children (mean age 3.7 years) and 80 children with special health care needs (mean age

7.2 years) received treatment for 13.5 teeth on average during a single operation.

The majority of the healthy patients were under 3 years old (50.8%). In that group, the greatest difficulty was behavior problems combined with severe early childhood caries. Therefore, behavior problems during dental treatment were the main reason for seeking treatment under general anesthesia.[8]

In our study, after excluding difficult surgeries for supernumerary or impacted teeth, there were 165 (89.1%) young children in Group B who were treated under general anesthesia because of a lack of cooperation. The percentage was higher than that reported by Tsai et al. (69.9%),[9] O'Sullivan and Curzon (76%),[10] Wang et al. (40%),[7] Vermenlen et al. (42%),[4] and Tarján et al. (49%).[11]

The ratios of boys to girls in Groups B and A were 1.7 and 1.9, respectively. This was similar to the study by Al-Eheideb et al (1.7:1).[12] That ratio was higher than that of Tsai et al. (1.2:1).[9] Boys may be less cooperative with dental treatment than girls.

Harrison et al. found that a greater number of extractions were carried out for chronically sick chil- dren, than healthy children with similar findings observed by Tsai et al.[9,13] and in the present study. Before the age of 6 years old, there was no difference in the total number of teeth treated in either group. However, the number of extracted teeth was greater in the disabled group. Underlying medical conditions may affect the treatment modality provided. The dentist may prefer a less complex dental procedure for a disabled child to avoid complications or the necessity for retreatment. For example, a tooth extraction is preferable to pulp therapy for periapical pathological teeth. Ibricevic et al. did not find any differences in terms of the extraction of teeth between healthy and disabled groups.[14]

However, in their study, the total number of procedures were significantly higher in the healthy group than the disabled group.

In the 1-6 year age group, the total number of restored teeth were greater in the healthy group. However, in the 1-18 year age group there was no significant difference between the two groups and there were more stainless steel crowns and pulptherapies performed in the healthy patients.

The patients in the disabled group were significantly older than those in the healthy group. Therefore, there were more permanent teeth that needed to be treated. In permanent teeth, crowns and pulp therapy are too complicated to be completed in one appointment, and therefore, dentists may choose alternative treatment, such as operative restoration or extraction. For the patients between 6 and 12 years old, the number of teeth treated were usually higher in the disabled group, however that was not the case for the total number of permanent teeth extracted. That was attributed to the different reasons for the dental treat- ment under general anesthesia in the two groups. One of the major reasons for dental treatment under general anesthesia in the healthy group was difficulty in extracting impacted teeth.

In Singapore, Vignehsa et al. found that disabled children had higher levels of oral disease and received less dental care.[15]

The same findings were presented by Nunn et al.,[16] Shyama et al.,[17] Gizani et al.[18] and Mielnik-Blaszczak et al and Chia-Ling Tsai, et al..[19,20,21] Mielnik-Blaszczak et al. also found that the dental treatment index was lower, especially in deciduous teeth. In the present study, more teeth were extracted and stainless steel crowns applied in the healthy group after 3 years old. Tooth decay becomes more severe when patients get older. However in group A, tooth decay was extensive or teeth need to be extracted before the patients were 3 years old. There was no difference in the various treatment modalities between the 1~3 and 3~6 year old children in the disabled group. Disabled children have a variety of medical conditions from very early in life regardless of their oral condition. As a result, we found more complicated dental problems in this group. The non-significant difference with low statistical power was due to the small sample of disabled patients from 1~3 years old. Furthermore, oral health education and early inter- vention for dental problems in the disabled group needs to be improved in our society.

Conclusions

Dental treatment performed under general anesthesia is necessary for very young children or those with special health care needs.

The underlying medical or mental condition may influence the dental condition and treatment modality provided. For disabled children, the dentist may prefer a dental procedure that is less complex or has a lower risk of complications, such as extraction.

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Effect of Plant Fixed Oil Extracts Incorporation to Heat Cured Denture Soft Lining Material on its Mechanical Properties

*Prof. Nadira A. Hatim**
Department of Prosthetic Dentistry ,College of Dentistry ,University of Mosul / IRAQ.
*Ali Khalil Hassan Sayidmarie***
Department of Prosthetic Dentistry ,College of Dentistry ,University of Mosul / IRAQ.

ABSTRACT

Introduction: Denture liners have been used in dentistry for many years. They are used to enhance the fit of poor fitting dentures and prevent trauma to sensitive mucosa. Patients with complete dentures are satisfied with the masticatory ability provided by the soft lining materials. Requests for improvements to certain features of denture base materials have also been grown.
Aims: The aims of this study were to evaluate the effects of incorporation of either single oil (Sesame, Thyme) or mixture of two oils (Sesame and Thyme) addition on some denture soft lining material (Vertex) mechanical properties (Tensile strength, elongation, Shore A hardness, modulus of elasticity); cured according two different curing cycles (short and long) after two periods of immersion 2 and 30 days.
Materials and Methods: A total samples of (200) were prepared from acrylic based heat cured denture soft lining material (Vertex), which divided into two main groups (short curing cycle and long curing cycle according to ADA) respectively, each main group was subdivided into four groups according to oil addition [Sesame, Thyme, mixed (Sesame and Thyme), and control group].
Tensile strength and elongation percentage tests were done on main group one (short cycle), while Shore A, modulus of elasticity tests were done on each of two main groups (short and long cycle). The tests were done after two periods of immersion in distilled water (two and thirty days).
Results: The results of this study showed that plant oil extract of (Sesame and Thyme) at 5% per volume addition into monomer resulted in significant viscoelastic properties enhancement at $p \leq 0.05$ (Tensile strength, elongation, Shore A and modulus of elasticity).
Conclusions: It is concluded that plant fixed oil extracts addition further enhanced viscoelastic properties of denture soft lining materials. Different curing cycle methods (short and long) had no effect on properties of denture soft lining material.

Introduction:

Denture liners used in prosthodontics to provide a cushioning layer on the fitting surface of a complete denture. The material absorbs some of the masticatory energy and reduces the energy transmitted to the underlying tissues (1, 2).

Soft-liners that are polymerized in the dental laboratory under controlled conditions similar to conventional laboratory-processed dentures exhibit greater physical and mechanical properties [3]. The acrylic-based soft lining materials strongly adhere to the acrylic resin denture base, but the plasticizer can be leached out by the saliva, resulting in the gradual hardening of the materials [4].

The distribution of large plasticizer molecules minimizes entanglement of polymer chains, thereby permitting individual chains to "slip" past one another. This slipping motion permits rapid changes in the shape of the soft liner and provides a cushioning effect for the underlying tissues [6].

Hardening of the material occurs if the liner's plasticizing agent is not covalently bound to the polymerized matrix, it can leach into saliva, resulting in a hardening of the liner over time [3]. Acrylic soft resins absorb water, swell and eventually deteriorate [6]. Phthalates have solubility in human saliva 20 times higher than in water [7]. It considered as one of the major reasons for failure of some soft liners [8]. It can results in the delivery of greater occlusal forces to the underlying mucosa and increased clinical complaints [9].

Tensile strength provides information on the ultimate strength of a soft denture liner when subjected to tension, whereas elongation provides data on the ability of a material to deform prior to failure and thereby gives an indication of the flexibility of the material [10].

Acrylic based soft lining material was the most resilient to deformation after thermocycling in the laboratory, followed by silicon based materials [11].

Acrylic resin lining materials demonstrated the greatest changes in viscoelasticity over time. Silicone and polyolephin materials demonstrated smaller changes with time [12].
Tensile properties are regarded as a general guide to the quality of rubbers [13]. Tensile strength of silicon based soft lining materials increased after thermocycling [14]. Acrylic resin liner is softer than the silicone liner, but is less resilient and can be affected by aging [15].

Shore-A hardness test of permanent soft liners is used to evaluate viscoelastic properties of the materials as it should distribute and absorb the functional forces during mastication by means of viscoelastic behavior [16]. The Shore hardness test employs a condensed cylinder. The ASTM specification for Shore

hardness specifies a test specimen "shall be at least 6mm thick the lateral dimensions of the specimen shall be sufficient to permit measurements at least 12mm from any edge" [17].

However, some researchers have carried out measurements on much thinner samples, presumably to mimic clinical use, such as soft lining materials for dentures. One example is a study by Canay on three soft lining materials using 2mm thick specimens [6].
A comprehensive experimental study made by Morgan of the effect of sample thickness on the measured Shore hardness, and other types of hardness. Shore hardness increased with decreasing thickness, the dependence increasing with decreasing hardness [18].

Hardness of plasticized acrylic resin soft lining materials over time, when curing procedures were modified. Polyzois concluded that processing method and time after processing have an effect on surface hardness of the tested materials [1].

The effects of aging by thermal cycling and mechanical brushing on resilient denture liners was investigated by Hermann, found that thermal cycling promoted increased hardness for plasticized acrylic lining materials [19].

There is a reasonably well-defined relationship between Shore A hardness and Young's modulus in the hardness [20].

Aims of the Study:

The aims of this study were to evaluate the effects of incorporation of either single oil (Sesame, Thyme) or mixture of two oils (Sesame and Thyme) addition on some denture soft lining material (Vertex) mechanical properties (Tensile strength, elongation, Shore A hardness, modulus of elasticity); cured according two different curing cycles (short and long) after two periods of immersion 2 and 30 days.

Materials and Methods:

Sesame seeds oil and Thyme oils have been extracted according to American Oil Chemists' Society. This method determined the oil content of oil seeds by solvent extraction. Soxhlet extractor as shown in Figure (1) was used for extraction. Petroleum Ether 70-80°C used as a solvent to dissolve raw material of plants [21].

For Sesame oil extraction 200 g of Indian Sesame seeds was grinded by electric coffee grinder at speed of 800-1000 rpm for one minute to produce final grinded particle size of 250 µm. Then about 100 g of grinded seeds enclosed with filter paper inside the distillation chamber for extraction, the round flask filled with 500 ml of solvent (Petroleum ether). The Soxhlet extractor heated by mantis at 45°C for about 6 hours and the solvent and extracts collected. This procedure was repeated for Thyme oil extraction.

To purify crude Sesame and Thyme oil extracts, the solvent should be evaporated using rotary evaporator to evaporate solvent under reduced pressure. The resultant crude oils extracts then collected.

For sample preparation, hard plastic foils (Imprelon, Scheu Dental) of different thicknesses were used. The sample models were prepared by using a CNC machine to cut precisely the plastic foils according to each sample shape and measurements. Tensile strength tests: A dumbbell's shaped model according to (ASTM D-412) [22], with dimensions of 100 mm length (33 mm of it as testing area), 16 mm width at grasping, and 3 mm width at testing area, with a 3 mm as thickness was used to prepare soft denture lining material samples moulds [23].

Figure 1 Soxhlet device used for extraction.

Shore A hardness test: A model with dimensions of 30 mm length, 15 mm width and 3mm thickness was used to prepare soft denture lining material samples moulds [24, 25]. See Figure (2).

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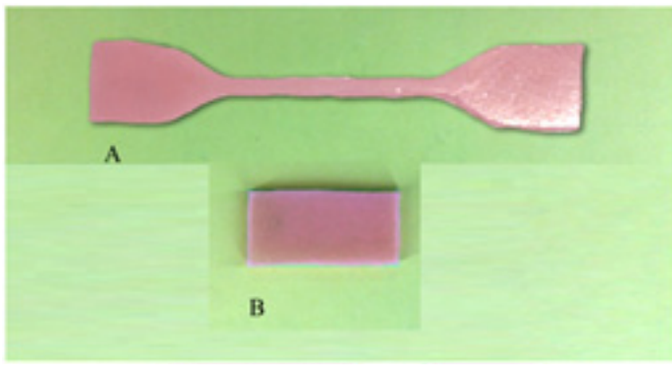

Figure 2 Soft liner samples. A: Tensile strength test. B: Shore A.

The plant oil extracts (Sesame and Thyme) were added into the monomer [26], at concentration of 5% per volume by an adjustable micropipette (DragonLab, China) with a ratio of 125:l for each 2.5ml monomer, while for mixed group a mixture of two oils (Sesame and Thyme 2.5% for each) were added to the monomer. The monomer was mixed with additives by a cement spatula until a homogenous mixture was produced, after that the powder was added as mentioned above.

Tensile strength evaluation has been performed only for all samples of short cycle group, at two time intervals two and thirty days after curing. These tests were performed using a universal testing machine (Tinius Olsen, USA) shown in Figure (3). Tensile strength evaluation was done at rate of 10mm/min according to ISO standard [23]. The samples were tested at room temperature 24°C. Five tests were performed for each sub-group.

The universal testing machine was connected to a computer through Qmat (ver. 5.37) software (Tinius Olsen, USA), ultimate tensile strength, elongation, and stress-strain curve were plotted by this program and then collected for analysis.

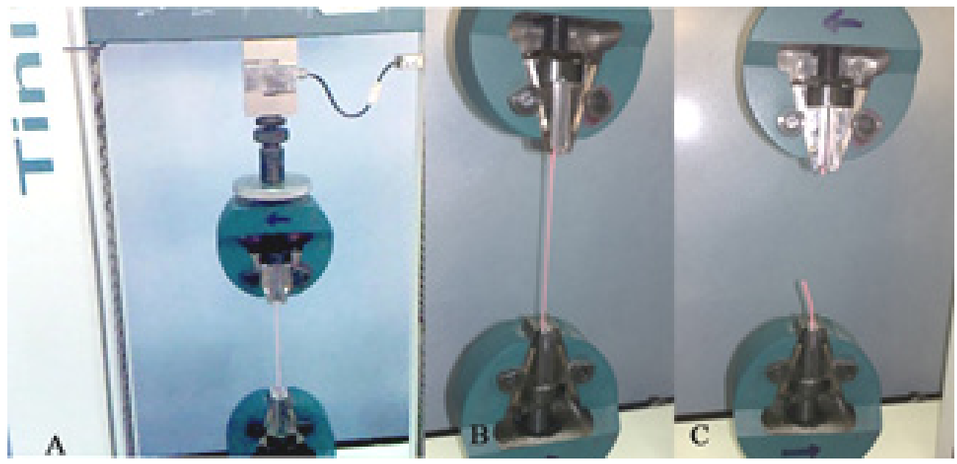

Figure 3 A: Universal testing Machine for tensile strength.

Both short and long cycle group samples were assessed for its surface hardness using Shore A scale, at two periods, two days and thirty days after curing. A Shore A hardness tester, (Zwick, Germany) shown in Figure (4) was used in this study. The test was performed according ISO standard [23] on the mentioned samples dimension. To reduce the error, the tests were repeated on three regions (top, middle, and bottom) of each sample, and then the average value was calculated. Five samples were tested for every subgroup. The samples were tested at room temperature 24°C.

Figure 4 Zwick, Shore A, hardness tester.

The relationship between Shore A hardness and Young's modulus was investigated in detail by Gent who derived the following semi-empirical equation which was used in the study [20]:

$$E(MPa) = \frac{0.0981(56+7.66s)}{0.137505(254-2.54s)} \quad \ldots\ldots \quad (27).$$

Where s = the Shore hardness, hardness scale should of 0–100

Results and Discussion:

Tensile strength and Elongation:

Tensile strength means (MPa) and standard deviation for the tested groups at two and thirty days are shown in Figure (5).

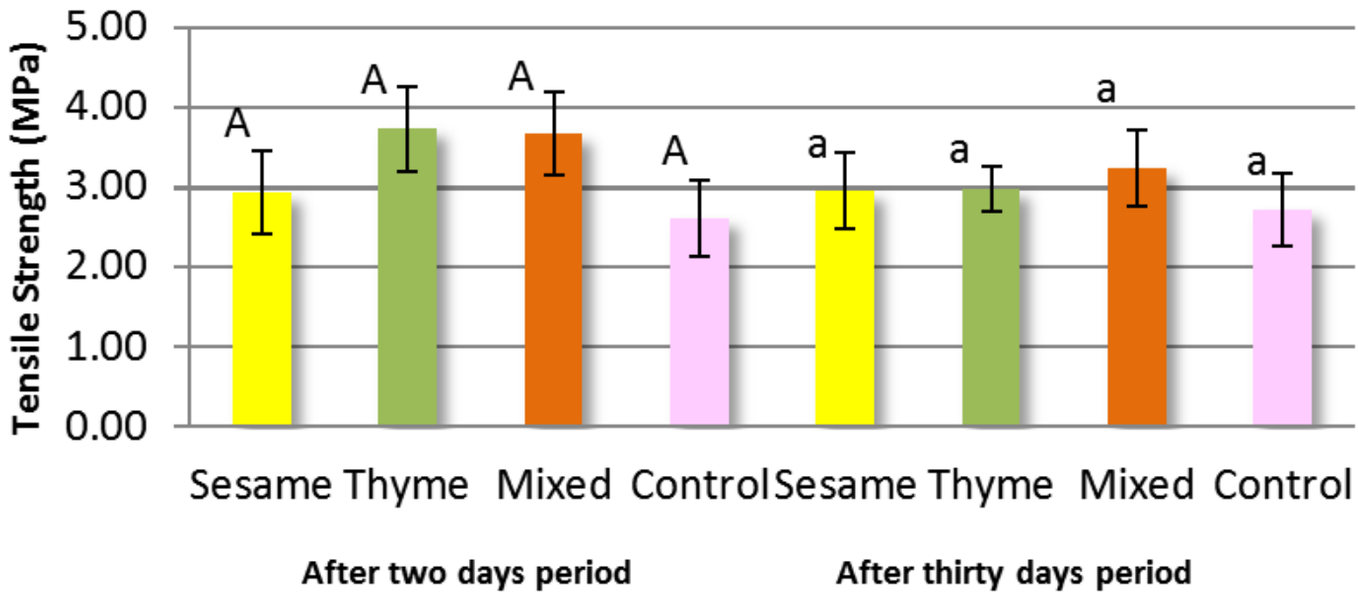

Figure 5 Means, standard deviation, and Duncan's multiple range test of tensile strength (MPa) for short cycle group at each two and thirty days periods. Different letters means significant differences.

One way ANOVA multiple comparisons to compare tensile strength means of short cycle sub-groups at two days and thirty days periods are shown in Table (1). The statistical analyses showed no significant difference between groups at two mentioned periods.

Duncan's multiple range tests for short cycle sub-groups at two days period and for thirty days periods are shown in Figure (5) along the two mentioned periods the tests indicated that there were no significant differences between tensile strength means of all tested groups. Tensile strength mean for mixed sub-group (Sesame + Thyme) was higher than other tested sub-groups and control.

Table 1 One way ANOVA, test for tensile strength for short cycle group at two days and thirty days.

Short cycle at two days					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.569	3	1.523	2.326	0.114
Within Groups	10.478	16	0.655		
Total	15.047	19			
Short cycle at thirty days					
Between Groups	0.664	3	0.221	0.799	0.512
Within Groups	4.436	16	0.277		
Total	5.100	19			

df: degree of freedom, *Sig.: significance at $p \leq 0.05$

Paired samples T-test was performed on short cycle group comparing means of tensile strength at

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periods of two days and thirty days is shown in Table (2), there was no significant difference between tensile strength means at two mentioned periods.

Table 2 Paired sample T-test for tensile strength for short cycle group at two days versus thirty days.

	Paired Differences		t	df	Sig. (2-tailed)
Tensile strength	Mean	Std. Deviation			
	0.2631	0.882	1.334	19	0.198

df: degree of freedom, *Sig.: significance at $p \leq 0.05$

Elongation percentage means (%) and standard deviation for the tested groups at two and thirty days are shown in Figure (6).

One way ANOVA multiple comparisons test to compare elongation percentage means between short cycle groups at two days and at thirty days periods are shown in Table (3). The tests showed no significant differences between groups that have been tested for elongation.

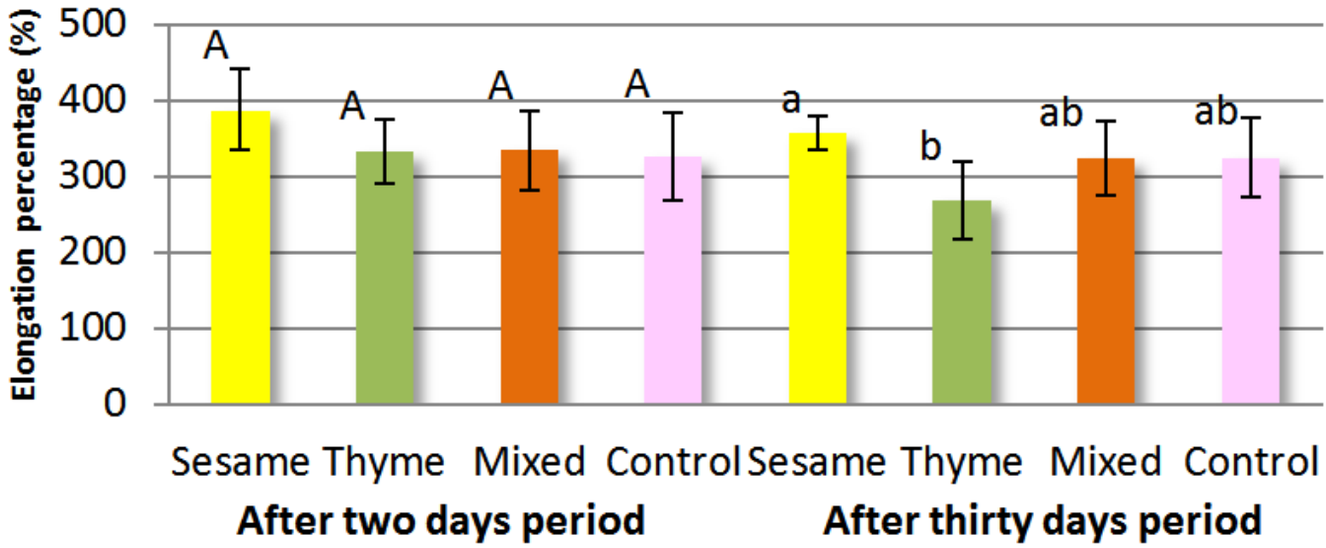

Figure 5 Means, standard deviation, and Duncan's multiple range test of elongation (%) for short cycle group at each two and thirty days periods. Different letters means significant differences.

Duncan's multiple range tests for short cycle groups to compare elongation percentage means at two and thirty days periods are shown in Figure (5). The highest elongation percentage mean was for Sesame group among other groups also there was a significant difference between groups at thirty days period.

Table 3 One way ANOVA, elongation percentage for short cycle group at two and thirty day's periods.

Short cycle at two days					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	11976.546	3	3992.182	0.996	0.420
Within Groups	64145.632	16	4009.102		
Total	76122.178	19			
Short cycle at thirty days					
Between Groups	20671.154	3	6890.385	2.643	0.085
Within Groups	41711.044	16	2606.940		
Total	62382.198	19			

df: degree of freedom, *Sig.: significance at $p \leq 0.05$

Paired samples T-test was performed on short cycle group comparing means of elongation percentage at periods of two days and thirty days is shown in Table (6), there was no significant difference between two periods.

Table 6 Paired sample T-test for elongation for short cycle group at two days versus thirty days.

	Paired Differences		t	df	Sig. (2-tailed)
Elongation	Mean	Std. Deviation			
	26.9	85.672934	1.404	19	0.176

df: degree of freedom, *Sig.: significance at $p \leq 0.05$

Thyme oil group showed the best tensile strength enhancement with mean of (3.72 MPa), while for mixed group was (3.67 MPa), and for Sesame (2.9 MPa) as compared with control group of (2.61 MPa).

Sesame oil group showed an increased elongation percentage, followed by Thyme oil then mixed group; all of these groups have an elongation higher than control group at two days period.

There was a significant difference between Sesame and Thyme oils groups after thirty days of immersion indicated that Thyme oil may be leached out more rapidly than Sesame oil, but both groups (Sesame and Thyme) did not differ significantly from control group at thirty days period.

Tensile strength and elongation enhancements was due to oil addition to the monomer of denture soft lining materials at (5%) as all the tested groups showed increased tensile strength mean, but not to a significant level.

Organic oily additive entered between polymer lattice leading to change in its physical configuration from irregular form into more regular and straight form this will lead to sliding of polymer chains onto each other producing a more flexible materials [28].

Small plasticizer molecules when added to a stiff uncross-linked polymer, reduce its rigidity. As small molecules surround large ones, the large molecules are able to move more easily. A plasticizer therefore lowers the glass-transition temperature (Tg) of the polymer, so a material that is normally rigid at a particular temperature may become more flexible. The glass-transition temperature has a strong effect on polymer strength properties [29].

In contrast, tensile strength and elongation means have been decreased for all groups of after a period of thirty days of immersion this was probably due to the leaching out of the low molecular weight plasticizer (like soft liner own plasticizer and oil additives) and absorption of water, which resulted in the deterioration in the viscoelasticity of the tested samples [12, 15].

Shore A hardness:

Shore A means and standard deviation for short cycle groups at two days and at thirty days periods were shown in Figure (6).

One way ANOVA multiple comparison test to compare Shore A means for short cycle groups at two days and thirty days periods are shown in Table (7). There were significant differences between groups.

Duncan's multiple range tests of Shore A means for short cycle groups at two days and at thirty days are shown in Figure (6) it showed a significant decrease in Shore A mean for Thyme oil group then Sesame oil group followed by mixed group (Sesame + Thyme) at two mentioned periods. There were significant differences between all the tested groups.

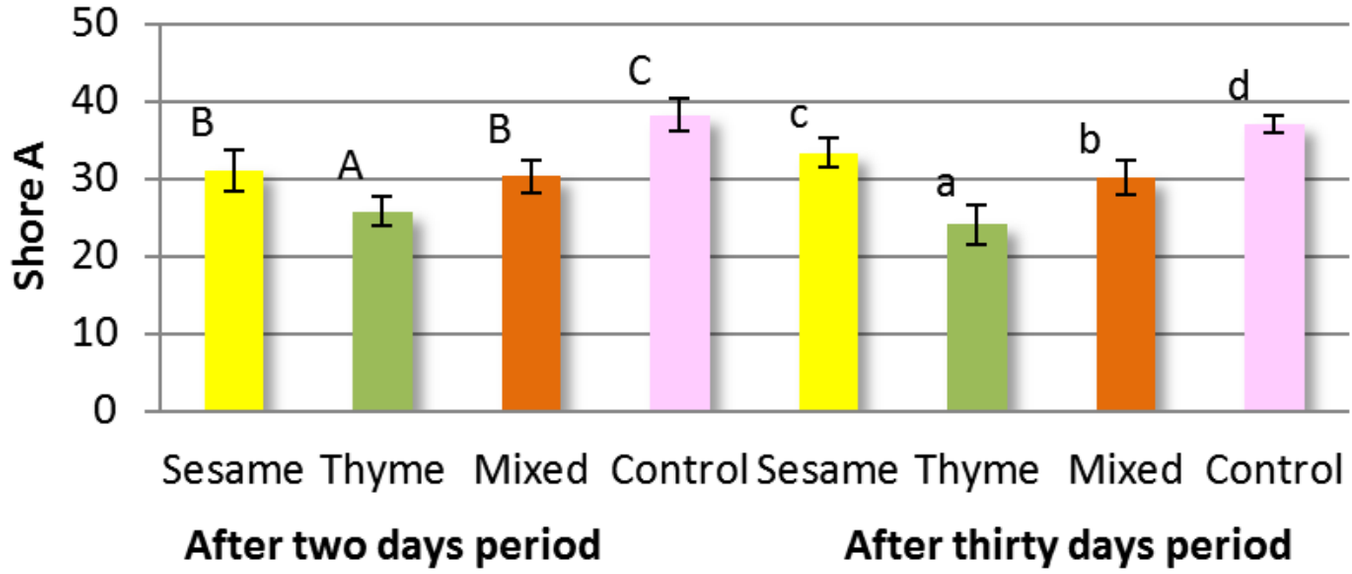

Figure 6 Means, standard deviation, and Duncan's multiple range test of Shore A for short cycle group at each two and thirty days periods.
*Different letters means significant differences (upper case for two days, lower case for thirty days).

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Table 7 One way ANOVA, test for Shore A means for short cycle group at two and thirty days periods.

Short cycle at two days					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	394.889	3	131.630	27.711	0.000*
Within Groups	76	16	4.750		
Total	470.889	19			
Short cycle at two days					
Between Groups	454.906	3	151.635	37.211	0.000*
Within Groups	65.2	16	4.075		
Total	520.106	19			

df: degree of freedom, *Sig.: significance at $p \leq 0.05$

Paired samples T-test was performed on short cycle group comparing means of Shore A at periods of two days and thirty days is shown in Table (8), there was no significant difference between two periods.

Table 8 Paired sample T-test for Shore A for short cycle group at two days versus thirty days.

	Paired Differences		t	df	Sig. (2-tailed)
Shore A	Mean	Std. Deviation			
	0.1833	2.585327	0.317	19	0.755

df: degree of freedom, *Sig.: significance at $p \leq 0.05$

Shore A means and standard deviation for long cycle groups at two days and at thirty days are shown in Figure (7).

One way ANOVA multiple comparison test to compare Shore A means for long cycle groups at two days and thirty days periods are shown in Table (9). There were significant differences between groups.

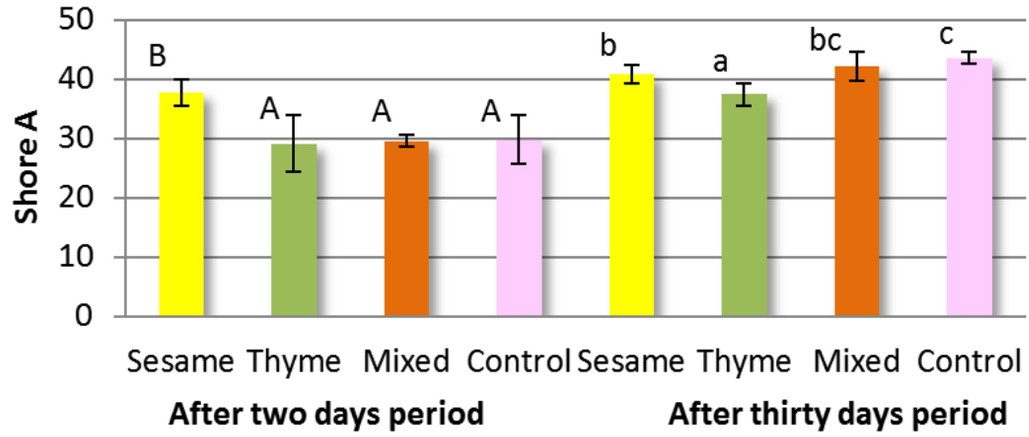

Figure 7 Means, standard deviation, and Duncan's multiple range test of Shore A for long cycle group at each two and thirty days periods. Different letters means significant differences.

Table 9 One way ANOVA, test for Shore A for long cycle group at two and thirty day's periods.

Long cycle at two days					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	257.200	3	85.733	7.574	0.002*
Within Groups	181.111	16	11.319		
Total	438.311	19			
Long cycle at thirty days					
Between Groups	104.283	3	34.761	10.463	0.000*
Within Groups	53.156	16	3.322		
Total	157.439	19			

df: degree of freedom, *Sig.: significance at $p \leq 0.05$

Duncan's multiple range tests of Shore A means for long cycle groups at two days and at thirty days are shown in Figure (7) it showed a significant decrease in Shore A mean for Thyme oil group compared with other groups at two mentioned periods.

There were significant differences between all the tested groups.

Paired samples T-test was performed on long cycle group comparing means of Shore A at periods of two days and thirty days is shown in Table (10), there was a significant difference between two periods.

Table 10 Paired sample T-test for Shore A for long cycle group at two days versus thirty days.

	Paired Differences		t	df	Sig. (2-tailed)
Shore A	Mean	Std. Deviation			
	-9.45	5.662305	-7.464	19	0.000*

df: degree of freedom, *Sig.: significance at $p \leq 0.05$

Independent sample T-test was done between Shore A mean values for two groups (short cycle versus long cycle) for all sub-groups, to find the differences between short and long curing methods for two and thirty days periods the results are shown in Table (11). It showed that there was no significant difference between groups at two days period while it showed a significant difference at thirty days period.

Table 11 Independent sample T-test comparing means of Shore A for short cycle versus long cycle groups at two and thirty day's periods.

Short cycle vs long cycle at two days						
	Levene's Test		t-test for Equality of Means			
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Equal variances assumed	0.12	0.731	-0.129	38	0.898	-0.2
Equal variances not assumed			-0.129	37.951	0.898	-0.2
Short cycle vs long cycle at thirty days						
Equal variances assumed	8.715	0.005*	-7.364	38	0.000*	-9.833
Equal variances not assumed			-7.364	29.537	0.000*	-9.833

df: degree of freedom, *Sig.: significance at $p \leq 0.05$

Shore A means were decreased significantly for all groups compared with control group, Thyme oil group was the softest group between other groups, high value of Shore A was for control group.

The addition of oil act as plasticizer changing the viscoelastic properties of the materials leading to decreased Shore A mean. Shore A mean was reduced to a level which is accepted by ISO 10139-2 as ISO standard for long term denture soft lining materials requires Shore A value ranging from 25 to 50 [23].

As the distribution of large molecules plasticizer minimized entanglement of polymer chains, thereby permitting individual chains to "slip" past one another. This slipping motion permits rapid changes in the shape of the soft liner and provides a cushioning effect for the underlying tissues [5].

After immersion in distilled water for thirty days Shore A means increased for all groups but not to a significant level, in the other hand all modified denture soft lining materials (with additive Sesame, Thyme and mixed oil groups) still had Shore A means significantly lower than that of control group which accepted by ISO range (25-50). This can be explained by the fact that oil additives have leaser rate of leaching out from denture soft lining materials than the original plasticizer of the same material.

Hardening of the material occurs if the liner's plasticizing agent is not covalently bound to the polymerized matrix; it can leach into saliva, resulting in a hardening of the liner over time [3, 19].

The results agreed with many authors who have suggested an increase in the Shore A means af-

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ter water immersion. Shore A hardness increased and reached the maximum value after a month [1].
It also agreed with Mutluay who studied the hardness changes in a variety of commercial soft liner products during long-term water storage, a gradual hardening of all other acrylic based soft liner products was found over the immersion period [30].

The effect of curing cycle was studied in Table (11) it showed that the method of curing did not affect significantly Shore A values of the tested samples at two days period. While, there was a significant difference between short and long curing cycle at thirty days in which Shore A mean for short cycle group was significantly lower than that for long cycle, the samples cured according to short cycle were softer than other.

This can be due to curing method as soft lining material cured with a high temperatures and pressure would likely exhibit lower levels of leachable components such as plasticizers [1].

The results agreed with Parr and Rueggeberg who discussed the effect of polymerization method on Shore A values they found when specimens were stored in water, a little difference was noted in physical properties based on method of polymerization could be that little difference exists in degree of polymerization, resin solubility [3].

Modulus of Elasticity:

Modulus of elasticity (MPa) means and standard deviation for short cycle groups at two days and at thirty days are shown in Figure (8).

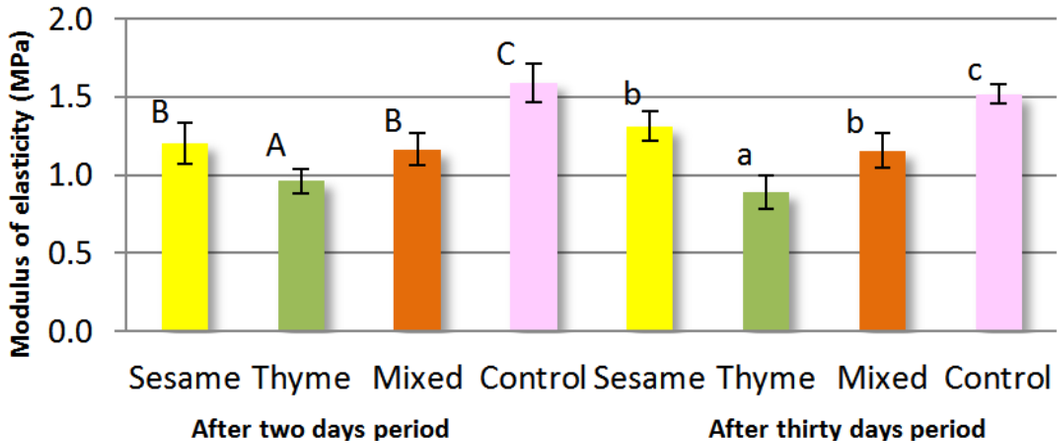

Figure 8 Means, standard deviation, and Duncan's multiple range test of modulus of elasticity for short cycle group at each two and thirty days periods.Different letters means significant differences.

One way ANOVA multiple comparison test to compare modulus of elasticity means for short cycle groups at two days and thirty days periods are shown in Table (12). There were significant differences between groups.

Duncan's multiple range tests of modulus of elasticity means for short cycle groups at two days are shown in Figure (8) it showed a significant decrease in modulus of elasticity mean for Thyme oil group then Sesame oil group followed by mixed group (Sesame + Thyme) at two mentioned periods. There were significant differences between all the tested groups.

Paired samples T-test was performed on short cycle group comparing means of modulus of elasticity at periods of two days and thirty days as shown in Table (13), there was no significant difference between two periods.

Table 12 One way ANOVA, test for Modulus of elasticity for short cycle group at two and thirty days.

Short cycle at two days					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.027	3	0.342	27.935	0.000*
Within Groups	0.196	16	0.012		
Total	1.223	19			
Short cycle at thirty days					
Between Groups	1.047	3	0.349	38.603	0.000*
Within Groups	0.145	16	0.009		
Total	1.192	19			

df: degree of freedom, *Sig.: significance at $p \leq 0.05$

Table 13 Paired sample T-test for modulus of elasticity for short cycle group at two days versus thirty days.

	Paired Differences		t	df	Sig. (2-tailed)
Modulus of elasticity	Mean	Std. Deviation			
	0.0084	0.128421	0.291	19	0.774

df: degree of freedom, *Sig.: significance at $p \leq 0.05$

Modulus of elasticity (MPa) means and standard deviation for long cycle groups at two and at thirty days periods were shown in Figure (9).

One way ANOVA multiple comparison test to compare Modulus of elasticity means for long cycle groups at two days and thirty days periods are shown in Table (14). There were significant differences between tested groups.

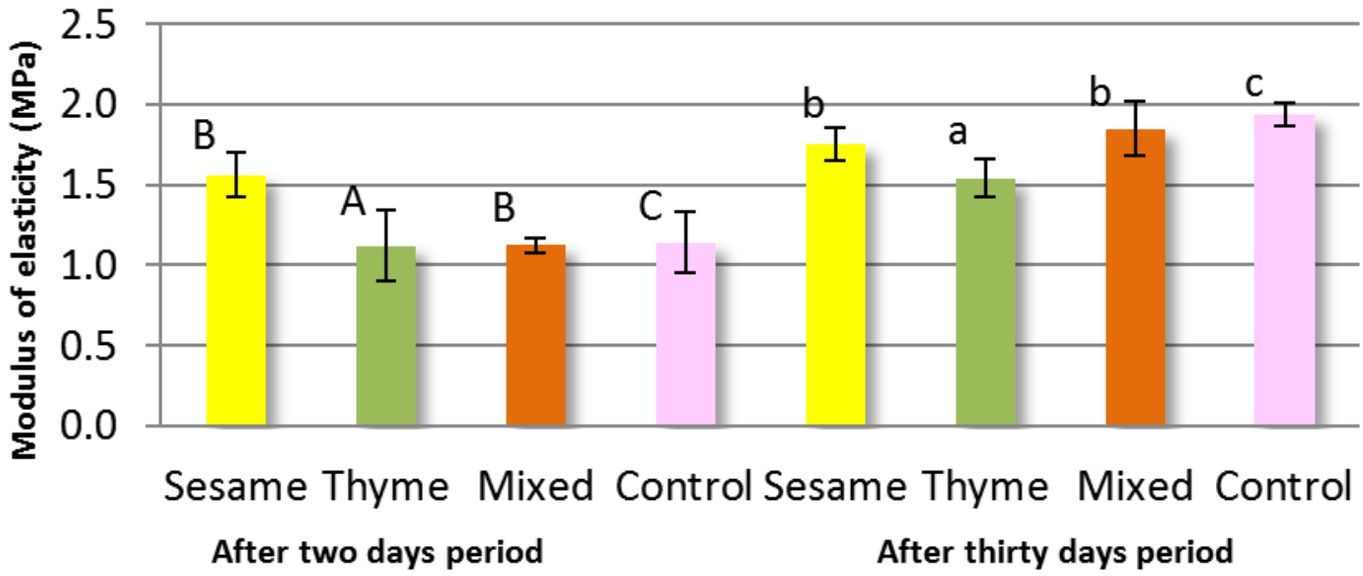

Figure 9 Means, standard deviation, and Duncan's multiple range test of modulus of elasticity for long cycle group at each two and thirty days periods.Different letters means significant differences.

Duncan's multiple range tests of modulus of elasticity means for long cycle groups at two days are shown in Figure (9) it showed a significant decrease in modulus of elasticity of Thyme oil group then control group followed by mixed group (Sesame+Thyme) at two mentioned periods. There was significant difference between the tested groups.

Table 14 One way ANOVA, test for modulus of elasticity for long cycle group at two and thirty days.

Long cycle at two days					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.699	3	0.233	8.887	0.001*
Within Groups	0.420	16	0.026		
Total	1.119	19			
Long cycle at thirty days					
Between Groups	0.440	3	0.147	9.734	0.001*
Within Groups	0.241	16	0.015		
Total	0.681	19			

df: degree of freedom, *Sig.: significance at $p \leq 0.05$

Paired samples T-test was performed on long cycle group comparing means of modulus of elasticity at periods of two and thirty days as shown in Table (15), there was a significant difference between two periods.

Table 15 Paired sample T-test for modulus of elasticity for long cycle group at two versus thirty days.

	Paired Differences		t	df	Sig. (2-tailed)
Modulus of elasticity	Mean	Std. Deviation			
	-0.5326	0.312073	-7.633	19	0.000*

df: degree of freedom, *Sig.: significance at $p \leq 0.05$

Independent sample T-test was done between modulus of elasticity mean values for two groups (short cycle versus long cycle) for all sub-groups, to find the differences between short and long curing cycle methods. For two and thirty days periods the results are shown in Table (16) it showed that there was no significant difference between groups at two days period, but there was a significant difference at thirty days period.

Table 16 Independent sample T-test for modulus of elasticity comparing short cycle versus long cycle groups at two and thirty day's periods.

Short cycle vs long cycle at two days						
	Levene's Test		t-test for Equality of Means			
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Equal variances assumed	0.108	0.745	-0.108	38	0.914	-0.008504
Equal variances not assumed			-0.108	37.925	0.914	-0.008504
Short cycle vs long cycle at thirty days						
Equal variances assumed	2.774	0.104	-7.827	38	0.000*	-0.549466
Equal variances not assumed			-7.827	35.371	0.000*	-0.549466

df: degree of freedom, *Sig.: significance at $p \leq 0.05$

Modulus of elasticity showed a significantly decrease in modulus for all groups compared with control group, Thyme oil group was the least significant modulus among other groups which were a significantly decreased modulus as compared with control group.

Low modulus of elasticity indicates softer materials compared with high modulus, as the area under the curve increased by decreasing the value of modulus of elasticity which represents the Tan value of the angle formed by stress-strain curve, for less Tan value. This means larger area under the curve for elastic region. So that, permanent deformation for the materials with low modulus will not occur rapidly as compared with materials of high modulus, this will enhance the cushioning action of the material which is one of the requirements of the ideal denture soft lining materials [31-33, 15].

This difference was corresponds Shore A values, since there was a reasonably well-defined relationship between Shore A hardness and Young's modulus in the hardness as they are proportionate directly [20].

These results agreed with Deb and Murata who found that acrylic resin materials showed a greater increase in the elasticity with time. This is probably due to the leaching out of the low molecular weight plasticizer and absorption of water, which resulted in the deterioration in the viscoelasticity [12, 32].

The results also agreed with Murata who proposed the desired Young's moduli of denture soft lining materials to be at the same range of the oral mucosa moduli from approximately (0.4-4.4 MPa), since all the tested groups moduli were ranged at the same values [16].

It also agreed with Lacoste-Ferre who measured denture soft lining material (Vertex) modulus of elasticity and found it within the range of modulus of elasticity measured for the oral mucosa at 37°C [34].

Conclusions and Suggestions

Conclusions:

From this study the following conclusions could be drawn:

1. Plant fixed oil addition at (5% per volume) resulted in viscoelastic properties enhancement (Tensile strength, elongation, Shore A and modulus of elasticity); Thyme oil addition resulted in best enhancement for denture soft lining material (Vertex).

2. Different curing cycle methods (short and long) had no effect on of denture soft lining material properties.
3. As a recommendation denture soft lining material (Vetex) with Thyme oil addition cured by using long curing cycle could be recommended.

Suggestions:

Further studies are needed on modified denture soft lining material to discuss: Porosity, water sorption, surface roughness for denture soft lining material after addition at two curing cycles.

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* nadirahatim2002@yahoo.com
**dralism@gmail.com


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Iraqi Dental Association