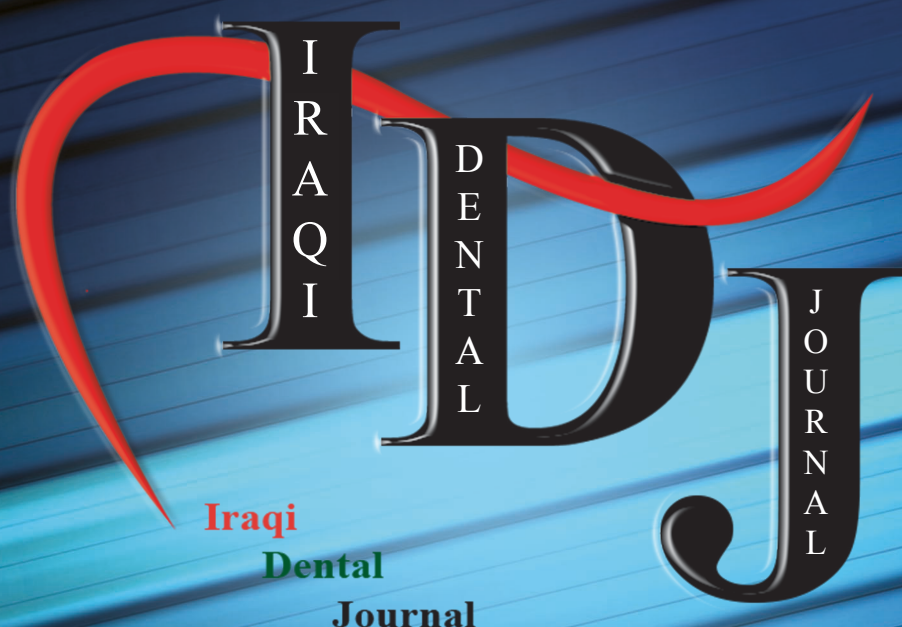




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# Iraqi Dental Journal



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The role of the IDJ is to inform its readers of ideas, opinions, developments and key issues in dentistry - clinical, practical and scientific - stimulating interest, debate and discussion amongst dentists of all disciplines. All papers published in the IDJ are subjected to rigorous peer review.

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## Make your deeds as a book, and choose a unique title to it

The patient who visits a dentist usually in a state of agitation and a degree of discomfort that's due to the fear of the dental treatments in general and some of its unknown aspects to the patient, Thus he pays special attention to every detail during his stay in the waiting room and what proof the dentist provide to him that he made the right choice to visit this dentist in particular , when the patient enters the treatment room he will have some questions which need answers,

Who will treat me ? What tools he will be using? Are these tools new and sterilized? What time will it take to complete me treatment? Will it hurt? What is the total cost of the treatment? In addition, some other questions that he keeps wondering about.

When the dentist answers these questions before being asked he would establish rapport between him and the patient.

The Ideal reception of the patient by the dentist is the one with a smile which is the first dose of treatment and it's considered a message that is directed to the heart and mind of the patient.. it would facilitate the treatment procedure .. all patients like to be received in such manner , and they sure deserve it for choosing you as their source of treatment and relief .. this is what wise minds state , so start by calling his name in a formal but lovely manner , using an appropriate title that suites his age or job , then ask him to sit on a regular chair not the dental chair , wait for a moment after welcoming him then start asking him questions that show your interest in him as a person , then start asking about his complaint , after these moments that is considers as a way to calm him ask your patient to sit on the dental chair , but you should make sure before the patient enters that you assistant cleaned the dental chair ,sprayed air freshener and removed the waste and used tissues and napkins that the previous patient used so that when the patient enters he would find a well organized , clean , beautifully smelling room with some soft music and most importantly a smile and warm welcome , then the assistant start the infection control procedure , setting up the sterilized and wrapped instruments on the dental tray and replacing the cups and all the used things by the previous patient , all this should be done in the presence of the patients so that he is sure all the instruments are sterilized , after the patient is seated the dentist should make sure he is wearing new gloves and wearing a nice perfume then tells the patients that he will start inspecting his teeth and explains what he is seeing and after he finish the examination process he can use diagrams and drawings to explain what he saw and what should be done and all the options the patient has , with the pros and cons of each choice and the total cost and time of each choice so that the patient can make an informed decision, he should comfort the patient that he will use all the pain control methods and provide the evidence to comfort the patient and make him feel respected by his dentist, if the treatment requires multiple visit the first priority is to relieve pain and remove the discomfort and to motivate the patient to care about his dental and oral health, the dentist should allow the patient to see every step of the treatment using intraoral camera or a mirror , and the dentist should answer all the questions the patient has after the treatment , then schedule an appropriate appointment for the patient and write it for him on a paper , and save the appointment in a specialized software or use an appointment agenda , the dentist should give the patient all the instructions in writing after detailed explanation of them .

With some treatment plans the patient should sign an informed consent form , to state that he is fully informed of all the aspects of the treatment , the cost and all the details of the agreement between the dentist and the patient, it is important that the patient don't feel the you are not paying attention to what he is saying , don't answer any phone call during the treatment unless for emergency and after asking the patient for his permission , you patient should see your medical uniform ,and see you as you put on you gloves and mask before starting the examination process , these acts will be like a title for you like how a book title is sometimes the cause for people to buy it , the patient will be impress and will talk about your manners , cleanliness, knowledge , humbleness and your generosity this is the method to be successful and this is how you would leave your touch on the souls of your patient .

to be continued ...



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## Evaluation of the Involvement of the Tempromandibular Joint in Patients with Osteoarthritis Using Computed Tomography Compared to Sonography for Detection of Osteoarthritic Changes.

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### ABSTRACT:

#### Objectives of the study:

To determine the extent of tempromandibular joint involvement in patients with osteoarthritis. To evaluate the correlation between clinical findings and radiographical findings.To evaluate of the accuracy of sonography in detection of osteoarthritic changes compared to Computed tomography.

**Materials and methods:** thirty six patients are exposed to CT scan(64-Brilliance) and compared the results with sonography(12.5Mhz) for evaluation of radiological changes, comparison between clinical and radiological changes also have been taken.

**Results:** There was significant correlation between clicking and joint effusion in computed tomography(CT),while tenderness showed significant correlation with osteophyte and joint effusion in sonography,other correlations show no significant correlation between clinical and radiological changes.

**Conclusions:** The radiographic changes in tempromandibular joint were positively correlated with duration of osteoarthritis. Sonography was more likely to be sensitive rather than specific in detection of osteoarthritic changes.

### INTRODUCTION

Osteoarthritis (OA) known as degenerative arthritis or degenerative joint disease or osteoarthrosis, is a group of mechanical abnormalities involving degradation of joints, including articular cartilage and subchondral bone<sup>(1)</sup>. Symptoms may include joint pain, tenderness, stiffness, locking, and sometimes an effusion. A variety of causes—hereditary, developmental, metabolic, and mechanical deficits may initiate processes leading to loss of cartilage<sup>(2)</sup>. When bone surfaces become less protected by cartilage, bone may be exposed and damaged. As a result of decreased movement secondary to pain, regional muscles may atrophy, and ligaments may become more lax<sup>(3)</sup>.

### MATERIALS AND METHODS

The study is started by using thirty six symptomatic patients diagnosed as osteoarthritis by specialist rheumatologist, with clinical finding related to osteoarthritis like pain,tenderness,crepitation, clicking and limited mouth opening. these patients are exposed to computed tomography(CT) scan (Philips – Brilliance 64) in Al-Karkh general hospital and then the results are compared with sonographic findings (Philips 12.5 MHz transducer) to see the disc displacement, effusion, erosion, flattening, osteolytic

and osteophytic lesions in the condylar head.The period of the study started from (october-2013 to june-2014).

### RESULTS

The result of the study showed that the mean age of osteoarthritic patients was (49.69), and female percentage (66.7%) and male(33.3%). Chief complain showed more predilection in the left side (28%) and bilateral showed(56%).Clinically : clicking (27.7%), crepitation(36.1%), tenderness(20.8%) and limitation in mout opening (50%). Radiographically Computed tomography(CT) scan showed osteophyte (18.05%) , joint effusion (37.5%) ,erosion(11.1%), disc displacement (50%) and flattening(36.11%). There was significant correlation between clicking and joint effusion in computed tomography(CT),while tenderness showed significant correlation with osteophyte and joint effusion in sonography,other correlations show no significant correlation between clinical and radiological changes. Association between computed tomography(CT) and sonography showed fair agreement in osteophyte detection,fair agreement in joint effusion,moderate agreement in detection of joint erosion,moderate agreement in reduction of space and anterior disc displacement and also moderate agreement in condylar head flattening.

Table: osteophyte comparing between CT and sonography.

		Sonography Osteophyte			
		Yes		No	
		No	%	No	%
CT Osteophyte	Yes	4	100.0	9	19.6
	No	-	-	37	80.4
	Kappa coefficient		0.397		

Table: joint effusion comparing between CT and sonography

		Sonography effusion			
		Yes		No	
		No	%	No	%
CT effusion	Yes	11	100.0	16	41.0
	No	-	-	23	59.0
	Kappa coefficient		0.387		

Table : Condylar erosion comparing between CT and sonography

		Sonography Erosion			
		Yes		No	
		No	%	No	%
CT Erosion	Yes	3	100.0	5	10.6
	No	-	-	42	89.4
	Kappa coefficient		0.502		

Table: Disk displacement comparing between CT and sonography

		Sonography Anterior partial displacement			
		Yes		No	
		No	%	No	%
CT Anterior partial displacement	Yes	21	100.0	15	51.7
	No	-	-	14	48.3
	Kappa coefficient		0.439		

Table: condylar flattening comparing between CT and sonography.

		Sonography Flattening			
		Yes		No	
		No	%	No	%
CT Flattening	Yes	12	100.0	14	36.8
	No	-	-	24	63.2
	Kappa coefficient		0.451		

DISCUSSION

Clinical signs show perdition to crepitation with percentage of 50% in the left side and 22.2% in the right side, both sides showed 36.1%.Other studies took both sides together which is also near to was seen by<sup>(1)</sup>with percentage (46%). Presence of crepitation differentiate osteoarthritis from masticatory muscles disorder and also indicates morphological changes in the condyle with irreversible damage <sup>(4)</sup>Radiographic findings by CT scan showed osteophyte in both sides with total 18.05%, joint effusion37.5% ,joint erosion 11.1%, disc displacement with reduced joint space 50% and condylar flattening( 36.11%) . other studies look similar in some result and differ in others. Like <sup>(5)</sup> which showed flattening in( 43.3%) ,<sup>(6)</sup> with (25.5%) also<sup>(7), (8)</sup> showed similar result for flattening in (40%). Another study <sup>(8)</sup> showed flattening in (35%) very close to our study in (36.11%).

In osteophyte we saw approximation between studies. Our study show (18.05%) in the same way <sup>(1)</sup> show osteophyte in (26.6%), <sup>(9)</sup> showed osteophytic similarity to our study in (21%). While <sup>(10)</sup> showed only (8%).

In erosion we saw variation between results: our study found(11.1%) most similar to <sup>(10)</sup> in(5.5%). While other study <sup>(1)</sup> showed (40%) and<sup>(9)</sup>other found (93%). This variation is referred to that erosion indicates early changes in the condylar head <sup>(11)</sup>, while our patients are mostly in advanced stages of osteoarthritis.

CONCLUSIONS

Osteoarthritis in tempromandibular joint may be unilateral or bilateral. About 50% of Patients with osteoarthritis have limitation in mouth opening. Clinical findings play a major role in diagnosis of osteoarthritis. The tempromandibular joint changes in osteoarthritis were the results of degenerative processes, in contrast to rheumatoid arthritis were the changes as a result of the disease.The radiographic changes in tempromandibular joint were positively correlated with duration of osteoarthritis. Sonography was more likely to be sensitive rather than specific in detection of osteoarthritic changes.

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## Evaluation of some trace elements levels in sera of patients with Angina Pectoris in Erbil city

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### ABSTRACT

**Background:** Angina pectoris(AP) is one of the most prevalent diseases in developed countries and is becoming an area of increasing concern in other parts of the world. Among the several causes of the disease alteration in the levels of trace elements are also important.

**Objectives :** This study was undertaken in order to investigate the serum trace elements level in patients with Angina pectoris compared to healthy individuals, and to find whether there is any relationship between serum trace elements levels and patients with Angina pectoris..

**Methods:** The study involved 50 patients with Angina pectoris(AP) for evaluation of these trace elements level ( Se Cu, Zn ,Fe& Cr ) as well as TG, TC and LDL-C and HDL as compared with 50 control subjects .

**Results** The results indicate that patients exhibited significant decrease in the serum of selenum(Se),zinc(Zn), copper(Cu), chromium(Cr) and iron(Fe) level ( $p<0.001$ ) as compared to the healthy controls. TG, TC and LDL-C were elevated in patients and HDL-C was lower in our patients,

**Conclusions.** Deficiency or suboptimal levels of micronutrients( Se ,Cu, Zn ,Fe& Cr ) may play a role in the development of Angina pectoris(AP). Measurement of serum trace elements level might provide additional and useful laboratory test for the assessment of the patients with Angina pectoris and oral trace elements may have a role in therapy.

**Key Words:** Trace Elements, Angina pectoris

### INTRODUCTION

Angina pectoris(AP) is the medical term for chest pain or discomfort due to coronary heart disease. It occurs when the heart muscle doesn't get as much blood as it needs. This usually happens because one or more of the heart's arteries is narrowed or blocked, also called ischemia. Angina pectoris is a common manifestation of coronary artery disease. The pain is caused by reduced blood flow to a segment of heart muscle (myocardial ischemia). It usually lasts for only a few minutes, and an attack is usually quickly relieved by rest or drugs (such as nitroglycerin). Also, it is possible to have myocardial ischemia without experiencing angina. Typically, angina is described as a "pressure" or "squeezing" pain that starts in the center of the chest and may spread to the shoulders or arms (most often on the left side, although either or both sides may be involved), the neck, jaw or back. It is usually triggered by extra demand on the heart: exercise, an emotional upset, exposure to cold, digesting a heavy meal are common examples. The two main causes of angina are coronary artery spasm, and atherosclerotic plaque buildup which causes critical blockage of the coronary artery<sup>(1)</sup>. The risk factors include: smoking, sedentary lifestyle, high blood pressure, or hypertension, high blood fats or cholesterol, hypercholesterolemia, diabetes

, family history of premature ischemic heart disease. Trace elements, which play a vital role in health and disease, have been the subject of several investigations concerning their role in the etiology of coronary heart disease in the recent.. Micronutrients and trace elements are very essential for the normal functioning of the body. Even though they are required in very small amounts, an alteration in the level of these elements may lead to serious impairments which in turn lead to diseases like CAD. Prospective studies have demonstrated reduced risk of coronary artery disease in subjects with a greater intake of vitamin E1 or vitamin C2, because these antioxidant vitamins inhibit oxidation of low-density lipoprotein (LDL), a critical event in the coronary artery disease. Further vitamin E and vitamin C, the two essential micronutrients, is capable to remove the oxygen-derived free radicals by virtue of their antioxidant property.<sup>(2)</sup> The role of essential micronutrient metals in lipid metabolism is of recent investigation. The metabolism of zinc (Zn) is significantly altered in patients with cardiovascular disease as evidenced by abnormally low plasma or serum concentrations of zinc. Recent studies have shown a relationship between zinc status and the metabolism of cholesterol and lipoproteins<sup>(3)</sup>. Magnesium (Mg), another trace element is essential for the activation of a variety of

enzymes involved in cellular metabolism, especially in neurochemical transmission and muscular activity. It has been shown that magnesium depletion modifies coronary blood flow, blood clotting and atherogenesis<sup>(4)</sup>. There is a strong relationship between iron levels and cardiovascular disease. It has been observed that the amount of iron has been increased considerably in patients with acute myocardial infarction, which in turn can stimulate the lipid peroxidation. The present study evaluate the role of the trace elements such as iron, zinc, chromium and selenium in patients with Angina pectoris and their sequential variation in the complication of acute Angina pectoris associated with different risk factors taken in to account.<sup>(5)</sup>

### MATERIALS AND METHODS ,SUBJECTS

The study was conducted on 50 patients (30 males and 20 females) with AP, with a mean age of  $58.23 \pm 19.1$  years who were randomly selected from patients admitted to Rzgary hospital. The study also included 50 healthy volunteers [(29 males and 21 females with a mean age of  $55.31 \pm 12.72$  years as control group.

### Instrument used and Procedure

Serum selenum(Se),zinc(Zn), copper(Cu), chromium(Cr) and iron(Fe) were determined by using 1275 A A Varian, atomic absorption spectrophotometer. Working standard were prepared for each metal and then studied. A standard curve for each was worked out and amount of metal present in the sample was determined from the standard curve. The general procedure used for the determination of metals,, by atomic absorption spectrophotometer was set for metals according to conditions required. Standard solution of metals 0.5-2.0 ppm were used to prepare standard curves of the metals by recording their absorbance. The absorbance of each metal was plotted against its concentration to obtain the standard curve. The amount of metals were obtained from the standard curve. Total cholesterol, Serum Triglycerides, HDL and LDL were measured enzymatically using commercial reagents (kits obtained from BioMerieux, France).<sup>(6)</sup>

### Blood Sampling and Analysis

Five ml. of venous blood was obtained from a suitable forearm vein into plain tubes, the tubes centrifuged for 30 minutes, the serum then separated and kept in capped plastic tubes in deep freeze ( $-20^{\circ}\text{C}$ ) until analysis.

### Statistical Analysis

Standard statistical methods were used to determine the mean, standard deviation (SD) and range. The unpaired Z- test, unpaired student t- test and Chi-square tests were used. All values quoted as the mean  $\pm$  SD. The accepted level of statistical significance was considered at  $p<0.05$ .<sup>(7)</sup>

### RESULTS AND DISCUSSION

The level of serum trace elements selenum (Se), zinc (Zn), copper (Cu), chromium (Cr), iron(Fe), Total cholesterol, LDL, TG, and HDL, were measured in two groups consisting of 100 individuals aged between 40 – 60 years, one group consisting of healthy individuals served as control and the other group consisting of individuals with Angina pectoris of the same age group served as a experimental group. The analysis of results show that the level of Zn was significantly lower in both sexes in patient with AP (Figure 1) as compared with control,  $P<0.001$ . The mean  $\pm$  SD for serum Zn in healthy individuals was  $118 \pm 12.6 \mu\text{g}/\text{dL}$ , while in Angina pectoris was  $59 \pm 9.3 \mu\text{g}/\text{dL}$  as shown in (Table 1).

Table (1): Serum-trace elements level in the control group and patients with AP

Serum metals	Mean $\pm$ SD		*P-value
	Controls (n=50)	AP patients (n=50)	
Zn ( $\mu\text{g}/\text{dL}$ )	$118 \pm 12.6$	$59 \pm 9.3$	$P<0.001$
Cr ( $\mu\text{g}/\text{L}$ )	$17 \pm 3.36$	$0.45 \pm 0.093$	$P<0.005$
Se ( $\mu\text{g}/\text{L}$ )	$120 \pm 17.5$	$37.5 \pm 8.32$	$P<0.001$
Fe ( $\mu\text{g}/\text{L}$ )	$140 \pm 15.6$	$47.2 \pm 5.25$	$P<0.001$
Cu ( $\mu\text{g}/\text{dL}$ )	$135 \pm 12.9$	$53.2 \pm 2.61$	$P<0.001$

Zinc is a vital element in maintaining the normal structure and physiology of cells. The fact that it has an important role in states of cardiovascular diseases has been studied and described by several research groups. It appears to have protective effects in coronary artery disease and cardiomyopathy. Intracellular zinc plays a critical role in the redox signaling pathway, whereby certain triggers such as ischemia and infarction lead to release of zinc from proteins and cause myocardial damage. In such states, replenishing with zinc has been shown to improve cardiac function and prevent further damage. Thus, the area of zinc homeostasis is emerging in cardiovascular disease research.<sup>(8)</sup>

The status of Zn has been shown to have an important correlation in the metabolism of cholesterol and HDL, two important molecules involved

in the disease. The results of this investigation demonstrate that hypozincemia and hypercupremia were consistent with other studies. Animal experimental evidence suggests that the dietary Zn may be a significant factor in coronary heart disease. The exact mechanism of alteration of these trace elements is not known.<sup>(9)</sup> Some factors such as dietary deficiency, anorexia and possible use of drugs may be major components. Besides these factors, low serum Zn levels have been related to excess release of steroids due to the release of leucocyte endogenous mediators which redistributes the body Zn from serum and may cause a drop in serum Zn and also due to elevated levels of  $\alpha$ -macroglobulin which is a transport protein containing large amounts of Zn. A decrease in the levels of Zn and HDL-C strongly suggests the role of Zn in cholesterol and lipid metabolism<sup>(10)</sup>.

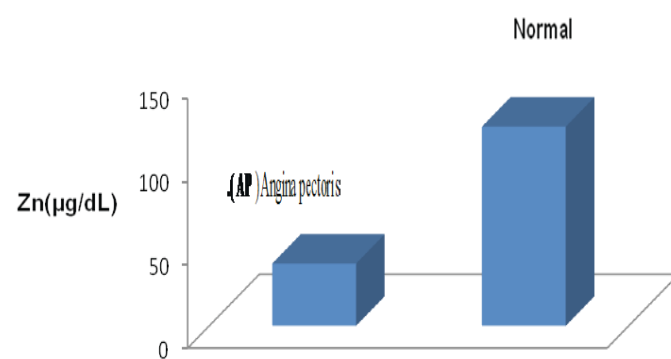


Figure1 : Comparison of serum zinc between controls and groups of Angina pectoris

There are several reports that show zinc was used to both prevent angina pectoris and effectively treat it in humans, some animal research and much biochemical and molecular biology research showing means to prevent atherosclerosis. Hennig *et al.*<sup>(11)</sup> pointed out that there is evidence that zinc can provide antiatherogenic properties by preventing metabolic physiologic derangements of the vascular endothelium. Because of its antioxidant and membrane-stabilizing properties, zinc appears to be crucial for the protection against cell-destabilizing agents such as polyunsaturated lipids and inflammatory cytokines. Zinc also may be antiatherogenic by interfering with signaling pathways involved in apoptosis. Certain lipids and zinc deficiency may potentiate the cytokine-mediated inflammatory response and endothelial cell dysfunction in atherosclerosis. Thus, the antiatherogenic role of zinc appears to be in its ability to inhibit oxidative stress-responsive factors involved in disruption of endothelial integrity and atherosclerosis. Zinc appears to flush

LDL cholesterol, perhaps by action of ionic zinc on intracellular adhesion molecule (ICAM) inhibition, into the serum where LDL cholesterol is readily observed, thus decreasing arteriosclerosis, increasing circulation, terminating angina pectoris and restoring more youthful cardiac function.<sup>(12)</sup>

The results obtained in the present study revealed that serum Se was significantly lower in patients with Angina pectoris as compared to with control,  $P < 0.001$ . (Figure 2). The mean  $\pm$  SD for serum Se in Angina pectoris was  $37.5 \pm 8.32 \mu\text{g/L}$ , while in control was  $120 \pm 17.5 \mu\text{g/L}$  as shown in Table 1. This result is in agreement with the results obtained by Salonen<sup>(13)</sup>, his results observed low serum selenium level in patients with CH compared with controls, he suggested a correlation between low Se level and CH. Finally he considered low Se level is one of the important factors for CH because Se compounds may protect cell membrane against different oxygen radicals

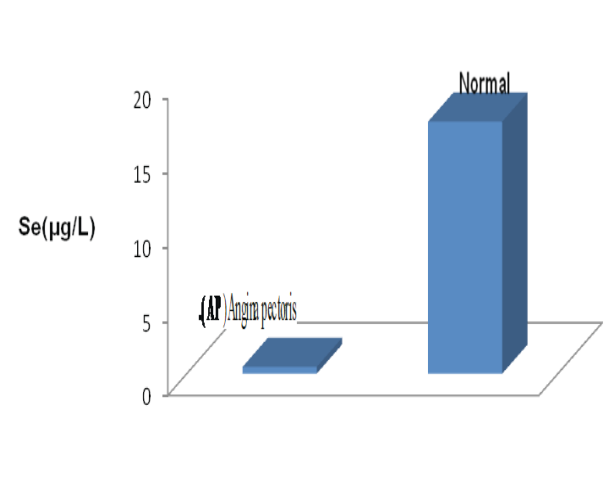


Figure2: Comparison of serum Selenium between controls and groups of Angina pectoris

A potent antioxidant, Selenium is an important cofactor for the body's natural antioxidant glutathione peroxidase system. It has been found that low selenium levels along with other risk factors play an important role in developing dilated cardiomyopathy.<sup>(13)</sup> In a stress situation with great demand for oxygen to the heart muscle, it could be that insufficient amount of the necessary selenium compound lead to accumulation of dangerous amount of hydroxyl radicals with serious damage to the cell membrane and triggering of platelets aggregation and this is the cause for formation of thrombus. This is one of the important risk factors for AMI. If sufficient Se had been available, the thrombus formation might have been avoided. Besides it had been illustrated that the

crucial role that Se, the co-factors of one of the major antioxidant enzymes of the myocardium, plays in determining the vulnerability of the heart to ischemia and reperfusion.<sup>(14)</sup>

As shown in Table 1 the patients with Angina pectoris exhibited a significant decrease in the level of Cu ( $P < 0.001$ ). The mean  $\pm$  SD for serum Cu in AP was  $53.2 \pm 2.61 \mu\text{g/ml/dL}$ , while in healthy individuals was  $135 \pm 12.9 \mu\text{g/ml/dL}$ , as shown in (Table 1, Figure 3).

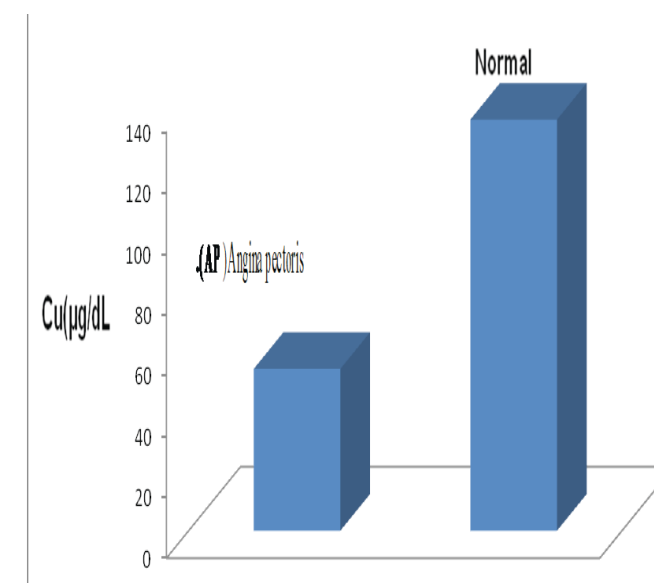


Figure 3 : Comparison of serum Copper between controls and groups of Angina pectoris

Copper deficiency has been associated with nephrotic syndrome<sup>(15)</sup> a variety of vascular abnormalities, hypochromic anemia<sup>(16)</sup> and impairment of blood supply to cardiac muscles with subsequent heart disease. There is more than one explanation for the mechanism of copper deficiency in enhancing cardiovascular diseases. Copper deficiency is usually associated with decreased myocyte fragility and increased myocyte size leading to decrease passive stiffness of cardiac myocytes and cardiac tissues with subsequent cardiac hypertrophy and cardiomyopathy.<sup>(17)</sup> Many studies in animals maintained on low copper diet revealed decreased connective tissue content of the heart in these animals. In addition to these observations altered  $\text{Na}^+ - \text{K}^+$  ATPase activity and decreased cross linking of elastin and collagen<sup>(18)</sup> may also contribute to decreased cardiac myocyte functional capacity with subsequent impaired pumping capacity of the heart and finally heart failure. The abnormal levels of copper in patient with CHF are probably due to changes in the concentration of caeruloplasmin in the plasma.<sup>(19)</sup> Ceruloplasmin is a major carrier protein for copper. About 90-95% of total copper is incorporated into caeruloplasmin while the rest is bound to albumin and amino acids.

the results showed significant decreases  $P < 0.005$  in the level of serum Chromium in AP patients  $0.45 \pm 0.093 (\mu\text{g/L})$  as compared with control group ( $17 \pm 3.36 (\mu\text{g/L})$ ) (Table 1, Figure 4)

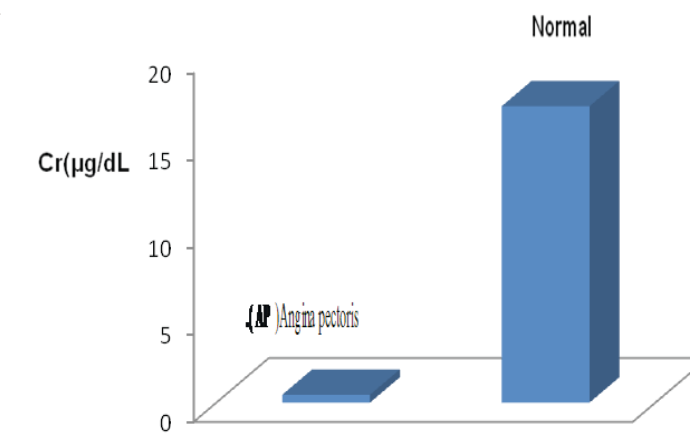


Figure4 : Comparison of serum Chromium between controls and groups of Angina pectoris

Chromium was discovered in 1957<sup>(20)</sup>, it has great effect on the production of insulin and controlling of diabetes. So chromium supplements appear to improve blood sugar control in diabetics. Several epidemiological studies linking chromium deficiency with risk factor of cardiovascular diseases, in individual taking B-blocker, chromium may raise the level of high-density lipoprotein HDL ) and lower total cholesterol and triglyceride levels. Previous research has further shown an association between Cr intake and heart disease.<sup>(21)</sup> So chromium supplementation has been observed to raise high. Cr deficiency has been shown to increase aortic lesions. Data in relation to this are scarce and even though our findings indicate lower Cr levels in patients, further investigation is needed to clarify this.<sup>(22)</sup>

in the present study, the concentrations of iron (Fe) was changed in the serum of patients with AP ( $47.2 \pm 5.25 \mu\text{g/L}$ ) in comparison to the healthy subjects ( $140 \pm 15.6 \mu\text{g/L}$ ). Total mean Fe was significantly lower in patients  $P < 0.001$  (Table 1, Figure 5)

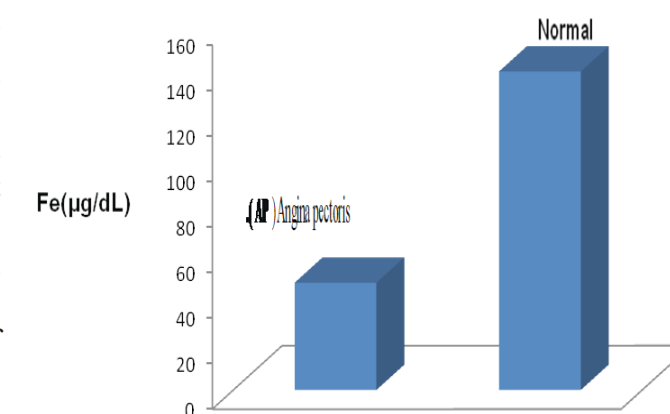




Figure5 : Comparison of serum Iron between controls and groups of Angina pectoris

Iron is an essential trace element that is crucial to normal cell functioning and its deficiency or excess is associated with several disease states. the mechanisms of pathogenesis could be mediated by direct effect of iron overload on the formation of hydroxyl-free radicals from hydrogen peroxide and superoxide via the Fenton and Haber–Weiss reaction.<sup>(23,24)</sup>

In the present study the concentration of cholesterol, LDL, TG, and VLDL are found to be increased as compared to the control, where as concentration of HDL decreased compared to the control (Table 1). Increase in the level of cholesterol in particular LDL cholesterol undergoes oxidation resulting in oxidized LDL in atherosclerosis. According to **Buczynski *et al*** <sup>(25)</sup> the level of oxygen free radicals is increased in hypercholesterolemia and would cause endothelial damage leading to the development of atherosclerosis.<sup>(26,27)</sup>

Table 1 – Serum level of cholesterol, HDL, LDL, TG & TC ) in normal and Angina pectoris patients.

Serum metals	Mean ± SD		*P-value
	Controls (n=50)	AP patients (n=50)	
(TG) Triglyceride(mg/dL)	118±12.6	59±9.3	P < 0.05
(TC) Total cholesterol (mg/dL)	17±3.36	0.45±0.093	P < 0.05
LDL-(mg/dL)	120±17.5	37.5±8.32	P < 0.05
HDL- (mg/dL)	140±15.6	47.2±5.25	P < 0.05

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Evaluation of panoramic image quality in three images system.

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ABSTRACT

In vitro study to evaluate the diagnostic image quality of dental panoramic radiography by comparing between conventional and digital systems.

**Aim of the Study:** The aim of this study was to compare and evaluate the image quality of panoramic radiograph.

**Material and Method:** Study comparing the image quality of dental Panoramic between conventional and digital in three dental institutions diagnostic imaging department.

Forty five panoramic image were collected and divided in to three groups consisting of conventional images obtained with STRATO 2000, CE by VILLA SISTEMI MEDICALI–ITALY (screen based film) Dimax3digital system pan/ceph, PLANMECA, Helsinki, Finland, and Kodak 8000 carestream health, France (CCD X–ray image sensor).

Image quality was assessed by rating the visibility of three evaluation aspect commonly found on panoramic radiographs for each image Depending on three evaluation aspect which is include the anatomy coverage, contrast and density of the teeth and anatomical structure, high score representing better image quality and the lower score indicating poor image quality.

**Results:** the data collected from the evaluation of digital and film based image by two examiner were analyzed by chi square and the difference was statistically significant.

**Conclusion:** The highest quality scores were obtained with carestream health digital system whereas images from Dimax3 digital system and conventional panoramic image type by VILLA SISTEMI were ranked significantly lower.

**Key words:** image quality, panoramic dental radiography.

choice.

INTRODUCTION

While panoramic imaging has been a great benefit to the dental profession, it still has some significant limitations. Some of these are associated with all film-based systems and include chemical processing and related quality assurance problems<sup>(1, 2)</sup>.

Digital panoramic imaging has become the latest technology of presenting radiographic details to the viewer for clinical diagnosis. Application of digital panoramic images is burgeoning due to its benefits such as fast communication of images, small storage space required and minimum contamination to the environment<sup>(3,4,5)</sup> since there are significant and quick progress in the new generation of digital panoramic and other radiographic imaging systems comparative studies have been conducted between digital and conventional dental panoramic images<sup>(6,7)</sup> although the various intraoral digital radiography system have been extensively tested for image quality and diagnostic efficacy only view studies investigated the same issues for digital radiography<sup>(8,9)</sup>. There is limited evidence available in the literature to prove the superiority of digital panoramic technique over the conventional panoramic techniques. Therefore, this study is designed to compare and evaluate the diagnostic image quality of dental panoramic radiography between conventional, old digital systems modality and new digital type with the aim of providing knowledge and preference for dentists and dental radiographers in regards to the benefits and clinical practicality of dental imaging as a modality of

MATERIALAND METHODES

We selected for this study three major dental institution diagnostic imaging department and 45 panoramic radiography were collected in all three institution and divided in to three groups consisting of one conventional panoramic and two digital panoramic.

One type of Conventional panoramic system

Conventional panoramic image was performed with panoramic x \_ray machine type STARTO 2000, CE by VILLA SISTEMI MEDICALIS ITALY with regular intensifying screen type Kodak Lanex and 6x12 inch screen type film used for film–based projection; x–ray machines were operated at range of 70–80 kVp and 10–12 mA.

Two types of Digital panoramic system

Dimax3 digital system pan/ceph, PLANMECA, Helsinki, Finland and new digital system Kodak 8000 digital carestream health, France with CCD x–ray image sensor the panoramic sensor was 15 x 30 cm. Both x–ray machines were operated at range of 70–80 kVp and 10–12 mA.

Analysis of image quality

Qualitative assessment of image quality was determined by two experienced dentists with at least 15 years of experience with panoramic radiography. The two reviewers were blinded to the exposure parameters and system protocols. Each image was scored subjectively with a 4-point ordinal grading



scale covering three major aspects which consisted of anatomical coverage, density and image contrast and also anatomical structures, so as to represent the diagnostic quality of each panoramic image. Although different aspect of evaluations have different score

Table ( 1) Image quality scores descriptions

Evaluation aspect	Image scores	Description
Anatomy coverage	1	Inappropriate coverage
	2	Suspected coverage
	3	Clinical need coverage
	4	Optimal coverage
Density and contrast	1	Poor density and contrast
	2	Inadequate density and contrast
	3	Adequate density and contrast
	4	Excellent density and contrast
Anatomical structure	1	Diagnosis not possible
	2	Diagnosis is un certain
	3	Diagnosis is possible
	4	Certain possible diagnosis

RESULT

The result of the chi-square testing are presented in table 2 showing the statistical analysis between groups describing the aspect used in this study for evaluation of image quality there were no significant difference between all groups from the anatomical coverage aspect of view (p<0.005), contrast and density view also show no significant differences in respect to group 2 and 3while there is significant difference between group1,group2 and 1,3groups ,depending on the anatomical structure aspect of

Table (2) chi square between groups

	Group2&Group1			Group3&Group1			Group3&Group2		
	Chi-square	P-value	Sig	Chi-square	P-value	Sig	Chi-square	P-value	Sig
anatomical coverage	0.000	P>0.05	NS	0.000	P>0.05	NS	0.000	P>0.05	NS
density and contrast	10.01	0.019	S	10.986	0.012	S	1.021	0.600	NS
anatomical structure	7.041	0.049	S	2.785	0.248	NS	12.652	0.005	S

Table (3) chi-square between groups

	Chi-square	P-value	Sig.
Group1&group2	0.237	0.971	NS
Group1&group3	11.853	0.008	S
Group2&group3	13.11	0.004	S

Table (4) The best of these groups

	Chi-square	P-value	Sig.
Group1	14.057	0.008	S
Group2	14.437	0.004	S
Group3	15.062	P<0.01	HS

remarks, the numerical order for the grading scale remained unchanged with the higher (score of 3 or 4) representing better image quality and the lower score (score of 1 or 2) indicating poorer image quality.

evaluation there is significant difference between group 1,2 group 2,3 (P=0.049,0.005) respectively non-significant difference between group1,3 (p=0.248). While Chi square for the experimental groups (table 4) revealed statistically high significant differences among the three using system P= (0.004). Z Test between the three modalities of panoramic system appeared to have a significant difference reporting with the use of conventional and digital panoramic and highly significant difference reporting with use of carestream health digital system.

DISSUCTION

The present study evaluate three panoramic images (one conventional and two digital) We use two type of digital system in comparing the conventional (STARTO2000,CEbyVILLASISTEMIMEDICALIS ITALY) with first type of digital(Dimax3 digital system pan/ceph, LANMECA, Helsinki, Finland) found them to be equivalent no statistically difference were found in term of diagnostic quality in other hand there were statistically differences found between the conventional and the second type (Kodak 8000 digital carestream health, France) of digital and between the both digital system , this might be related to that the raters of the image in the study were experienced oral surgeons with extensive experience using the film based panoramic images long before they started using digital images and this could have been might have affected the outcome of the study because of the lack of familiarity with the digital panoramic radiography and the use of various image processing tools <sup>(8,9)</sup> .

There were some contradictory result from previous studies on diagnostic image quality in comparing image quality of conventional with digital panoramic radiography it has been reported that there was no significant difference in diagnostic image quality between conventional and digital imaging <sup>(1,10,11)</sup> . However several studies stated that diagnostic image quality in conventional panoramic imaging was much better than that in digital panoramic radiography <sup>(7, 12)</sup>.

Yalcinkaya *et al* <sup>(12)</sup> . observed that the differences in diagnostic image quality between conventional and digital panoramic were caused by the level variance of resolution and image noise however ,if digital panoramic image were evaluated by using an illuminator the light increases the intensity which leads to improvement in diagnostic image quality since the screen monitor has limited resolution ,image evaluation using illuminator (print out) resulted in higher diagnostic score compared to that on the screen monitor <sup>(13)</sup> .

both Gijbels *et al* and Ramesh *et al* also evaluated the diagnostic efficacy of digital panoramic (Sirona Dental system Germany) , and compared it with conventional panoramic images by means of subjective evaluation of image quality and they conclude that both conventional and digital performed equally well , in another study Ramesh *et al* evaluated the diagnostic quality of digital panoramic images acquired with orthophos DS (Sirona Dental) for detection of caries<sup>(1,13,14)</sup> .

Last but not least there is no doubt that the lack of statistically significant differences may be viewed as an endorsement for digital radiography by many due to there advantages over conventional

CONCLUSION

Digital panoramic image were found to be of comparable quality to conventional ones for such a diagnostic task the highest quality scores were obtained with carestream health digital system whereas images from Dimax3 digital system and conventional panoramic image type by VILLA SISTEMI were ranked significantly lower.

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# Immunohistochemical Evaluation of Epidermal Growth Factor Receptor (EGFR), MMP-2 and Heparanase in Pleomorphic Adenoma of Salivary Glands

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## ABSTRACT

**Background:** Salivary gland tumors are morphologically and clinically diverse group of neoplasms .The most common benign tumor is the pleomorphic adenoma, it contains the epithelial, myoepithelial and mesenchymal component, with variable morphological patterns. Epidermal growth factor receptor (EGFR) is a 170 KD glycoprotein which has a tyrosine kinase activity. It is found at abnormally high levels on the surface of many types of cells, so these cells may divide excessively in the presence of epidermal growth factor.MMP-2 is a widely studied matrix metalloproteinase which participates in extracellular matrix (ECM) degradation, having a wide range of substrates and able to degrade type I, IV, V, VII and X collagens, laminin, elastin, fibronectin and proteoglycans. Heparanase (HPA) is an endo-β-D-glucuronidase that has the activity of cleaving heparan sulfate (HS) side chains of heparan sulfate proteoglycans (HSPGs), the major proteoglycans of the extracellular matrix (ECM) and basement membrane (BM) which play a key role in preventing tumor cells invasion and metastasis.

**Aims of the study:** This study aimed to evaluate the expression of EGFR, MMP-2 and heparanase in pleomorphic adenoma of salivary glands and to correlate the expression of the aforementioned biomarkers with the clinical parameters, histological subtypes and components, and with each other as well.

**Materials and methods:** Twenty five paraffin blocks of pleomorphic adenoma were included in this study. Sections immunohistochemically stained with anti EGFR, anti MMP-2 and anti heparanase monoclonal antibodies (Mabs).

**Results:** Positive EGFR, MMP-2 and heparanase immunohistochemical expression was found in 22 (88%), 14(56%) and 21 (84%) of the studied cases respectively. Statistically non- significant correlation was found among the aforementioned markers with each other, and between the markers and any of the clinical parameters and histological classifications, except a statistically highly significant negative correlation revealed regarding EGFR expression with the squamous cells of epithelial component (p =0.001) and a highly significant positive correlation found regarding MMP-2 expression with the chondroid stromal component (0.003).

**Conclusions:** Histological variation of pleomorphic adenoma has no influence on its biological behavior concerning EGFR, MMP-2 and heparanase expression. The immunoscores reorded in this study are expected to contribute to a better understanding of the biological behavior of PA.

## INTRODUCTION

Pleomorphic adenoma is the most common benign salivary gland neoplasm characterized by neoplastic proliferation of parenchymatous glandular cells along with myoepithelial components, It derives its name from the architectural pleomorphism (variable appearance) seen by light microscopy <sup>(1)</sup>. It is also known as “benign mixed tumor, salivary gland type”, which describes its pleomorphic appearance as opposed to its dual origin from epithelial and myoepithelial elements. Classically it is biphasic and is characterized by an admixture of polygonal epithelial and spindle-shaped myoepithelial elements in a variable background stroma that may be mucoid, myxoid, cartilaginous or hyaline <sup>(2)</sup>. Epithelial elements may be arranged in duct-like structures, sheets, clumps and/or interlacing strands and consists of polygonal, spindle or stellate-shaped cells. Areas of squamous metaplasia and epithelial pearls may be present <sup>(3)</sup>. The tumor is not enveloped, but it is surrounded by a fibrous pseudo capsule of varying

thickness.

The tumor extends through normal glandular parenchyma in the form of finger-like pseudopodia, but this is not a sign of malignant transformation <sup>(2)</sup>.

Epidermal growth factor receptor EGFR also called, ErbB1, and HER1, a protein found on the surface of some cells and to which epidermal growth factor binds and ligand- stimulated receptor autophosphorylation causing the cells to divide<sup>(4)</sup>. This EGF receptor is a 170 KD glycoprotein which has the tyrosine kinase activity. It is found at abnormally high levels on the surface of many types of tumor cells, so these cells may divide excessively in the presence of epidermal growth factor <sup>(5)</sup>. Either a reduction in EGF binding to EGFR or over- expression of EGFR has been noted in keratinocytes and squamous cell carcinoma <sup>(6)</sup>.

The matrix metalloproteinases (MMPs) are a large family includes >20 zinc-dependent proteinases that degrade various components of the extracellular matrix such as fibrillar and nonfibrillar collagen,

proteoglycans, glycoproteins, and denatured collagen <sup>(7)</sup>. Because they are the only enzymes known to degrade the extracellular matrix and the basement membrane, they are thought to play a major role in tumor cell metastasis. It is now well established that MMPs exert diverse biological properties that are far beyond mere ECM degradation. MMPs cleave a variety of different substrates, including other MMPs, cytokines, growth factors, cell-adhesion molecules, and cell surface receptors, as well as other non-ECM proteins <sup>(8, 9, 10, 11)</sup>. Thereby, they can control tumor cell proliferation and survival and regulate new blood vessel growth in tumors <sup>(12)</sup>.

Prominent MMP members are the gelatinases, MMP-2 and MMP-9, which have been associated predominantly with the ability of tumors to invade and become neovascularized. <sup>(13)</sup>. MMP-2 belongs to the gelatinase subfamily of the MMPs <sup>(14)</sup>. Gelatinases are distinguished by their fibronectin-like gelatin-binding domain, which allows them to degrade non-fibrillar and denatured collagen <sup>(15, 16)</sup>. MMP-2 overexpression has been reported in many neoplasms <sup>(7)</sup>.

Heparanase, also known as HPSE, is an enzyme that acts both at the cell-surface and within the extracellular matrix to degrade polymeric heparan sulfate molecules into shorter chain length oligosaccharides.<sup>(17)</sup> The successful penetration of the endothelial cell layer that lines the interior surface of blood vessels is an important process in the formation of blood borne tumour metastases. Heparan sulfate proteoglycans are major constituents of this layer and it has been shown that increased metastatic potential corresponds with increased heparanase activity for a number of cell lines.<sup>[18]</sup> Due to the contribution of heparanase activity to metastasis and also to angiogenesis, the inhibition of heparanase activity is considered to be a potential target for anti-cancer therapies. Heparanase is preferentially expressed in human tumors and its over-expression in tumor cells confers an invasive phenotype in experimental animals <sup>(19)</sup>. The enzyme also releases angiogenic factors from the ECM and thereby induces an angiogenic response in vivo. <sup>(20)</sup>

## MATERIALS AND METHODS

Twenty five representative pleomorphic adenoma formalin –fixed, paraffin –embedded tissue blocks were selected randomly from the files of the Oral Pathology laboratory/College of Dentistry/ University of Baghdad, Al-Shaheed Ghazi Teaching Hospital Laboratories /Medical City /Baghdad, and private laboratories/Baghdad. The clinical data were obtained from surgical reports available with the

tissue specimens.

Four µm thick sections were cut and hematoxylin and eosin slides were prepared for histopathological reassessment. The histopathological subtypes and epithelial and mesenchymal components were assessed<sup>(3)</sup>. Another 4 µm thick sections were cut for immunohistochemical staining with anti EGFR, MMP-2 and heparanase monoclonal antibodies (Mabs) (US Biological -USA). Negative and positive controls were included in each IHC run. Breast adenocarcinoma blocks were used for EGFR and heparanase, and colon cancer blocks for MMP-2 (according to antibodies manufacturer).

For immunohistochemistry, the sections were mounted on positively charged slides. Slides were baked in hot air oven at 65°C overnight. Sections were sequentially dewaxed through a series of xylene, graded alcohol and water immersion steps. Antigen (Ag) retrieving was done for heparanase while this step was omitted for EGFR and MMP-2 Abs as recommended by the manufacturer. Then endogenous peroxidase activity was blocked followed by blocking the non- specific staining. Primary Abs (100 ml) were applied for each section. A dilution of (1:50) for EGFR, (1:59) for MMP-2, and (1:100) for heparanase was used. After an overnight incubation and washing with phosphate buffered solution (PBS), secondary Abs were applied, incubated and rinsed with a stream of PBS. Primary Abs were visualized with 3,3-diaminobenzidine (DAB) chromogen, then counterstained with Mayer’s hematoxyline, dehydrated and mounted.

The immunoreactivity in tumor cells was classified and scored as follows: - For MMP-2, 0 negative or non –reactive, (1+) 1%-10% positive tumor cells, (2+) 11%-50% positive tumor cells, (3+) >50% positive tumor cells<sup>(21)</sup>. For EGFR, 0 negative staining of the considered cells, (1) <10%, (2) 10-50%, (3) 51-80% and (4) ≥ 80% positive staining of the considered cells<sup>(22)</sup>. For heparanase, 0= no staining, (1) staining of 1-25% of tumor cells (weak positive), (2) 26-50% (moderate positive), (3) 76-100% (strong positive) <sup>(23)</sup>.

Pearson correlation (χ chi square) test, t-test and ANOVA were applied to find the relations of the studied markers with each other and with the various clinicopathological parameters, p value<0.05 was considered significant.

## RESULTS

### Clinicopathological data

The study sample consisted of 11 males (44%) and 14 females (56%) with an age range of (22-59)



years, (60%) of them were within the age groups above 30 years. The majority of the cases 21 (84%) were located in the parotid gland followed by 4 cases (16%) were located in minor salivary glands. The studied cases were histopathologically classified as classic subtype in 15 cases (60%), and the remaining ten cases were classified as stroma-rich and cell-rich subtypes, 5 cases for each (20%). (Table 1)

Table 1: The demographic data and histological classification of the study sample

Age	Frequency	Percent%
21-30	10	40
31-40	6	24
41-59	9	36
Total	25	100
Sex		
Male	11	44
Female	14	56
Total	25	100
Site		
Parotid	21	84
Minor salivary gland	4	16
Total	25	100
Histological classification		
Classic	15	60
Stroma- rich	5	20
Stroma- poor	5	20
Total	25	100

Histopathological examination revealed that plasmacytoid myoepithelial cells were the most common cell type, being present in all studied tumor cases (25 cases 100%). Basaloid cells were present in 11 cases (44%) representing the second most frequent cellular type, followed by cuboidal cells which were found in 10 cases (40%). Spindle cells were the fourth most frequent cell type, being present in 6 cases (25%). Squamous cells and clear cells each were found in only two cases (8%). While oncocytic cells were considered occasional findings as they were present in one case only. Additionally mucous cells were not found in any of the studied cases. Focal cellular atypia was seen in 4 cases (16%).

Ductal formation was found in 15 cases (60%) of which 8 cases were of the classic histologic subtype, 4 cases stroma- poor subtype and the remaining 3 cases stroma -rich subtype . Trabeculae formation was found in 7 cases (28%) ,the majority of them 5 cases were of the classic subtype followed by 2 cases

were of stroma-poor subtype .Cystic formation was seen in 7 cases (28%) , 4 cases of them were of the classic subtype followed by 2 cases were of stroma-poor subtype and one case stroma –rich subtype. Solid pattern was found in only one case which was related to the stroma –poor subtype.

Considering the stromal components, Chondroid areas were seen in 15 cases (60%), 10 cases of them were of the classic subtype followed by 3 cases were of stroma-rich subtype. Hyalinization was found in 7 cases (28 %) which were mainly of the classic subtype in (6 cases) and only one case was of the stroma-poor subtype. Myxoid areas were found in 4 cases (16% ), of which 2 cases were of the stroma –poor subtype and one case for each of the other two subtypes. Calcifications were seen in only 3 cases (21 %) distributed equally among the three histological subtypes.

Assessment of the immunohistochemical expression of EGFR, MMP-2, and heparanase Mabs

In this study the positive immunohistochemical expression revealed was as follows: - for EGFR 22 (88%) of the cases were positive (Fig.1,2,3), of which 5 cases showed weak immunopositivity, while the other seventeen cases were moderate. For heparanase 21 cases (84%) were positive (Fig.4,5,6), moderate expression was seen in 11 cases and weak expression in 10 cases. For MMP-2, positive immunoexpression was found in 14 cases (56%) (Fig.7,8), 12 of them showed moderate expression score and the remaining 2 positive cases showed weak expression score.

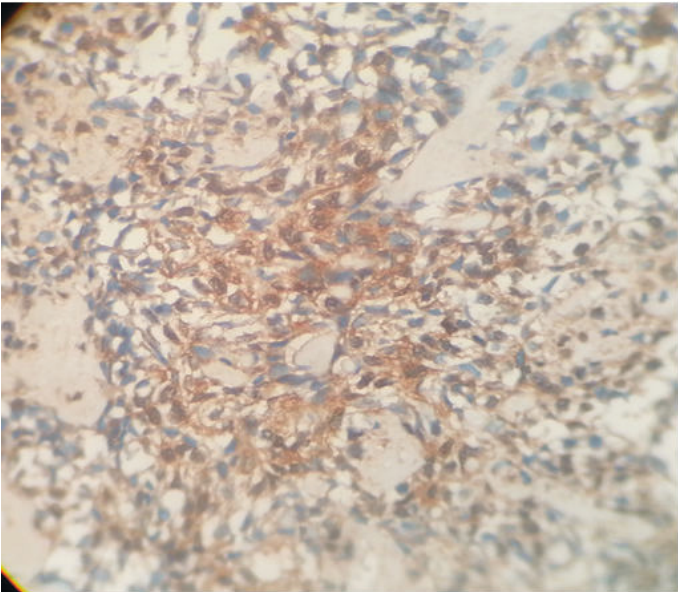


Figure 1: Positive membranous EGFR immunostaining (X40)

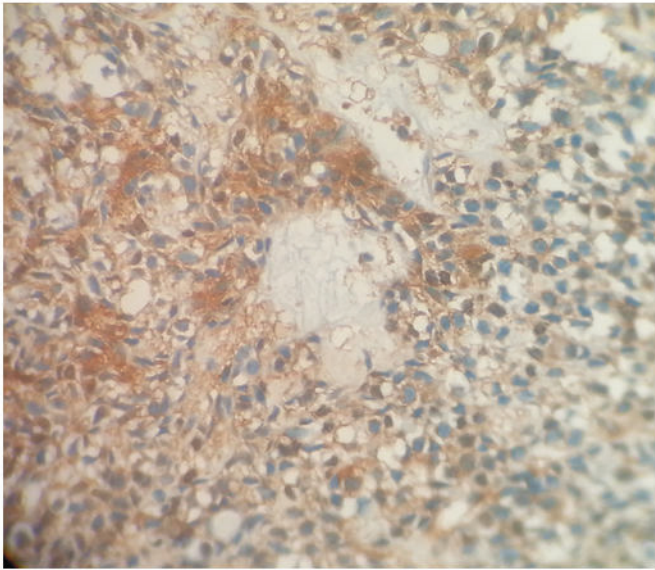


Figure 2: Positive membranous and cytoplasmic EGFR immunostaining (X40)

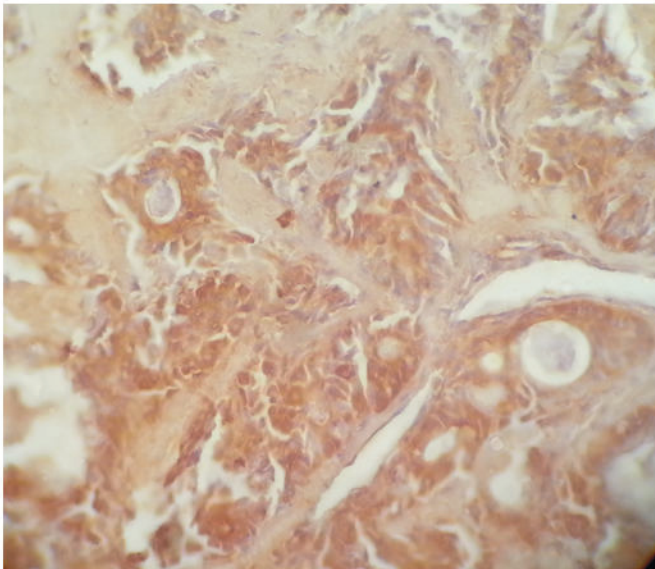


Figure 3: Positive membranous and cytoplasmic EGFR immunostaining (X40)

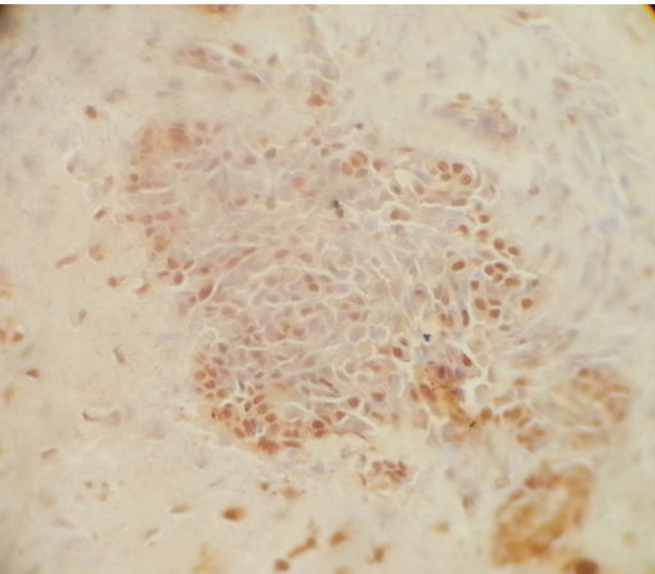


Figure 4: Positive cytoplasmic and nuclear heparanase immunostaining (X40)

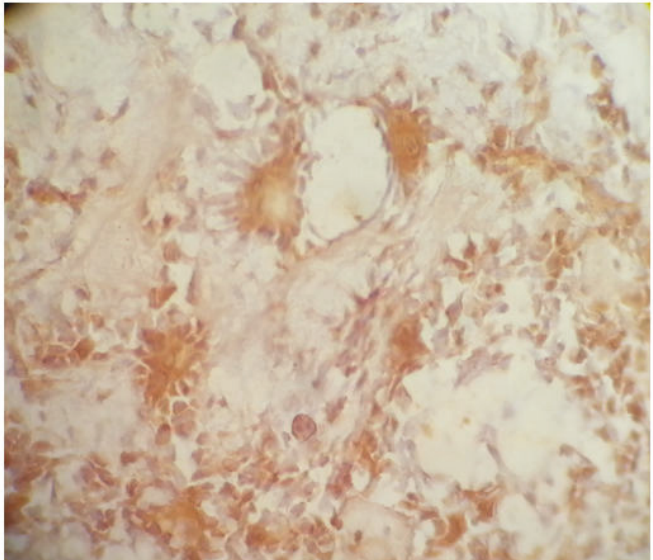


Figure 5: Positive cytoplasmic heparanase immunostaining (X40)

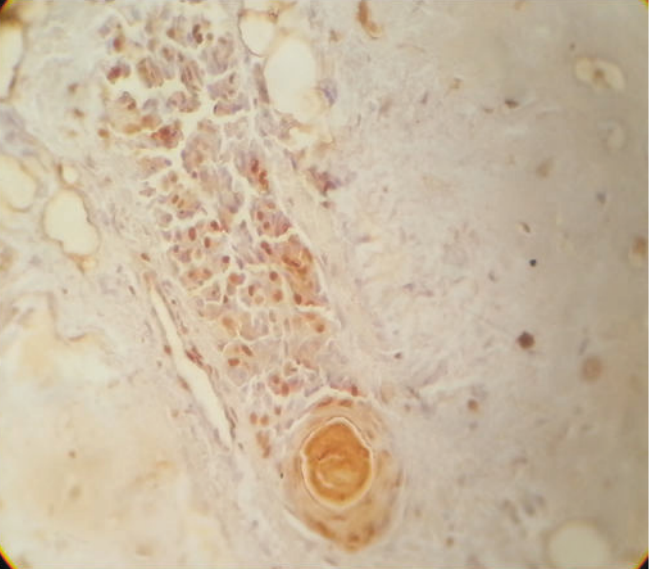


Figure 6: positive cytoplasmic and nuclear heparanase immunostaining (X40)

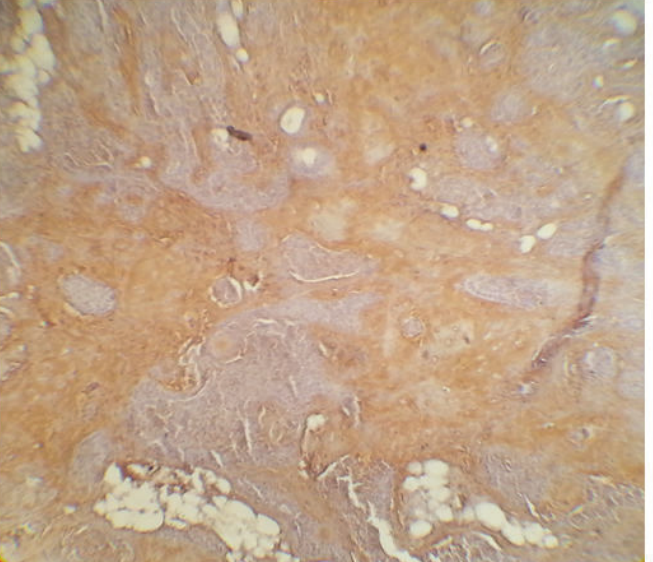


Figure 7: Positive cytoplasmic MMP-2 immunostaining (X40)



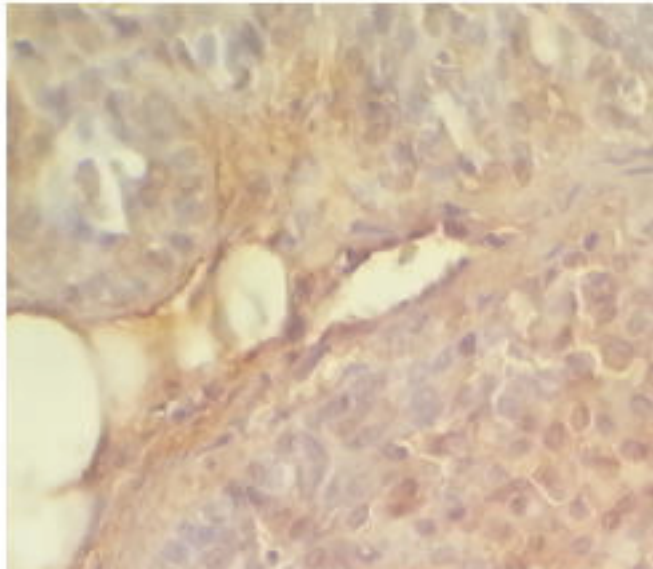


Figure 8: Positive cytoplasmic MMP-2 immunostaining(X40)

The correlation of the studied markers with the clinicopathological findings and with each other

The results of the present study revealed statistically non- significant correlation of the studied markers with the age, the site and the sex of the study sample, according to chi-square, ANOVA, and t-tests respectively.

ANOVA test showed statistically non -significant positive MMP2, EGFR, and heparanase correlation with the histological subtypes (p=0.696, 0.567& 0.780) respectively. A non- significant correlation was also observed with respect to atypia as well as with all morphological patterns that recorded in the study.

Concerning the correlation with the various epithelial components, the findings revealed non -significant correlation with all cell types which demonstrated in the study. Whereas a statistically highly significant negative correlation was only found between EGFR expression and squamous cells (p value = 0.001). For plasmacytoid cells t- test couldn't be computed because there were no negative cases, all the cases were positive.Table2

Table 2: Correlation of the studied markers with the squamous cells of epithelial component

t-test for Equality of Means			
	T	df	Sig. (2-tailed)
MMP2	1.488	23	.150
EGFR	-1.502	23	.001
Hep	1.149	23	.262

A non- significant correlation observed with myxoid, hyalinized, calcified stromal components,

while a statistically highly significant positive correlation was only found in regards to MMP-2 immunoexpression with chondroid stromal component (p =0.003).Table3

Table 3:correlation of the studied markers with the chondroid stromal component

t-test for Equality of Means			
	T	df	Sig. (2-tailed)
MMP2	3.393	23	.003
EGFR	.646	23	.525
Hep	1.207	23	.240

Correlating the studied markers with each other, a statistically non significant positive correlation was seen among them according to chi-square test. (Table4)

Table 4: correlation of the studied markers with each other

		MMP2	EGFR	Hep
MMP2	Pearson Correlation	1	.171	.331
	Sig. (2-tailed)		.414	.106
	N	25	25	25
EGFR	Pearson Correlation	.171	1	.019
	Sig. (2-tailed)	.414		.928
	N	25	25	25
Hep	Pearson Correlation	.331	.019	1
	Sig. (2-tailed)	.106	.928	
	N	25	25	25

DISCUSSION

The salivary gland pleomorphic adenoma is a benign epithelial neoplasm, histologically characterized by a great diversity of morphological aspects. Its structural pleomorphism is given both by the epithelial component, as a result of the cytological differentiations and the growing patterns, and by the stromal component because of its rich morphological and quantitative diversity. In addition Pleomorphic adenoma has a tendency for local recurrence which is a significant problem (3).

The variable types of morphological patterns and cells, besides the high frequency of PA highlights the importance of evaluating these variables for correct diagnosis of this tumor (1, 24).However, these factors frequently fail to distinguish between more or less aggressive tumours. Therefore, specific markers need to be identified that are related to tumour progression. Special stains and immunohistochemistry are not necessary for the diagnosis in most cases, but they

can be used to identify the different cell types and also early malignant changes (25). On the basis of these facts this study was conducted to search some aspects of the biological behavior of PA in relation to its various histological patterns through the immunohistochemical evaluation of several biomarkers namely, EGFR, MMP-2 and haparanase expression.

To the best of our knowledge, this study is the first detailed report considered these markers altogether in respect to the various histological aspects in an attempt to explain the fact behind the aggressive behavior of this benign classified tumor in regards to the expression of these markers which have been reported to be expressed or highly expressed in malignant tumors including salivary tumors. (26, 27, 28)

In the present study, PA was more frequent in the parotid gland of female patients with (60%) of cases in the age groups above 30 years, as it has been reported previously to be encountered most commonly in the parotid gland, females been affected more than males (24, 29, 30, 31) and the peak incidence is the fourth and fifth decades (29, 30, 32, 33).

Regardless to the great variety of histopathological aspects, the main diagnostic feature of PA is the presence of both epithelial and mesenchymal-like tissues. The proportion of these tissues has been used to sub-classify this tumor; however, it does not have therapeutic or prognostic significance (1). In the current study, classic subtype corresponded to (60%) of the cases, this finding disagrees with those reported by others (2, 3, 34) who found that stromal -rich subtype being the most predominant.

Plasmacytoid cells were the most frequent cell type seen in this study followed by basaloid cells. Similar findings were reported by Ito et al, 2009(3). The predominance of plasmacytoid cells was explained by Ellis and Auclair (1) that these cells appear to be in transition from one form to the other.

Cuboidal cells were the third most common cellular type. Identical results were reported by Ito et al, 2009(3). These cells were considered to have a pre-chondroprogenitor phenotype; they express cartilage-derived morphogenic protein (CDMP-1), that may play a role in the acceleration of the transdifferentiation from cuboidal neoplastic myoepithelial cells to lacunar cells in an autocrine manner (35). Oncocytic cells were considered occasional finding, this again comes in accordance to the finding of Ito et al, 2009 (3). Cellular atypia was seen in (16%) of the cases, which is similar to previous studies (3, 36).

Mesenchymal elements are considered to be

related to neoplastic myoepithelial cells migrating into stroma (37), the present study showed that chondroid areas were the predominant feature followed by hyalinization , which agrees with Ito et al, 2009 (3). whom explained the presence of hyalinization to be related to an aggressive behavior or malignant transformation of PA.

Immunohistochemical results showed mainly weak to moderate EGFR positive staining in (88%) of the cases irrespective to the histological variation. This is in agreement with Zheng et al (38) who found EGFR expression significantly higher in pleomorphic adenoma than in normal lacrimal glands; While Yamada et al, 1989(39) reported that EGFR staining in salivary pleomorphic adenoma not to be high (33.8%). However, increased (EGFR) expression in PA was explained to support the hypothesis of an association with early events in malignant transformation of pleomorphic adenoma (38).

Non significant correlation was found neither with the various histological subtypes nor with the different epithelial components, except a highly significant negative correlation was obtained with squamous cells (p=0.001), this correlation is reasonable and excepted since EGFR is reported to be expressed by normal and neoplastic epithelial cells including salivary gland tumors, however; no previous reports concerned this correlation to compare with. Zheng et al 1995 and Yamada et al, 1989 (38, 39) in their studies they only stated that positive staining for EGFR was mainly limited in tumor cells in trabecular or duct-like arrangement and squamous metaplastic cells of tumor tissue; similar staining pattern was seen in the present study.

Concerning MMP-2 immunoreactivity (56%) of the cases were weak to moderate MMP-2 positive and the remaining were negative, similar results were obtained by AL-Rawee et al(40), who detected positive MMP-2 immunoreactivity in 8 cases (42.1%) out of 19. Many studies reported that the immunoscores of MMP-2 detected in tumor cells were significantly increased in malignant tumors compared to benign ones. In one study significantly higher MMP-2 expression in carcinomas and active PA than adenomas and common PA has been revealed(41) and LuYann,2010 (42). found a significant difference of MMP-2 score results between normal salivary gland tissue, pleomorphic adenoma, and different malignant salivary tumors. However, MMP-2 expression in PA may explain the invasive potential of this tumor since it has been reported that the detection of MMP-2 in benign salivary tumors is a common event for cells of



tumor and stroma, the active tumor group can secrete enough MMP-2 for degradation of ECM<sup>(43)</sup>.

Only the chondroid stromal component revealed a highly significant positive correlation with MMP-2 ( $p=0.003$ ) suggesting the tendency of the chondroid predominant cases to metastasize.

The current results showed weak and moderate positive heparanase expression in (84%) of the cases. To the best of our knowledge, there is no previous study concerned heparanase in PA to compare with; they mainly concerned the malignant salivary gland tumors. Ben-Izhak et al,<sup>(25)</sup> reported heparanase upregulation in 70% of cases in malignant salivary gland tumors suggesting its strong implication in tumor metastasis. Heparanase activity has long been correlated with the metastatic potential of tumor-derived cells<sup>(44)</sup>. Thus its expression in PA might reflect an aggressive behavior.

Angiogenesis plays an important role of invasion and metastasis in the salivary gland tumors, not only provide protection for tumor survival, but also remove its metabolite, it create the condition for the transfer and infiltration by lysing the matrix surrounding endothelial cells thus enabling the invasion of new vascular structures into the tissues<sup>(45)</sup>, and since heparanase has previously been considered as a proangiogenic mediator due to its ability to release HS-bound angiogenic growth factors, such as basic fibroblast growth factor and vascular endothelial growth factor, sequestered in the ECM<sup>(44)</sup>, thus its expression revealed in this study may explain its role in tumor angiogenesis.

The immunoscores reorded in this study are expected to contribute to a better understanding of the biological behavior of PA. Further studies are needed to elucidate this fact.

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The Effect of Iraqi White Mustard Seed Extracts on Periodontal Disease

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ABSTRACT

this study was conducted on white mustard ,which obtained from college of agriculture ,Baghdad university .to assess the effect of mustard on plaque and gingivitis .

**Objective** to monitor its safety and had effect to decrease plaque and gingivitis .

**Material and method** 30 subject attend periodontal dep,was using as mustard mouth wash in different concentration for 15 days then their effect were assessed .

**Result** the reduction in plaque and gingival scores from the base line to 15 days ,the differences were found statistically significant .

**Key word** mustard ,mouth wash, antibiotic .

INTRODUCTION

This study was conducted on white mustard scapis alba seeds which belong to brassicaceas family .mustard is one of the world’s most important spice crops some of the earliest known documentation of mustard uses dates back to Sumerian and Sanskrit text from 3000b.c. and appeared in Chinese writings’ before 1000b.c. mustard has been referenced by many scholars and factors prominently in the Bible .

Water extract had effeteness to inhibit bacteria’s and yeast, it act at different PH gradient the activity reduced when it was for the effect of white mustard seeds extract .

The white mustard “scinapis alba” seeds which belong to brassicaceae family. The chemical composition of seeds were 2.16% moisture 2.6, 24% protein 37.14% sat 4.75% fiber 5.03% ash and 24.68% carbohydrate. Sinapis alba seeds are used as a spice and herbal supplement in medical practice (Court, 1986) also known to induce hydrocyl radical scavengers and have antioxidant activity, anti microbial, anti cancer and anti moplastic properties (Amaromiz et al., 1999; Schung an Osawa, 1998; Tesaki et al., 1998; Eskin et al., 2007). However, relatively few studies have been conducted to evaluate the activity of Sinapis-alba seeds against oral pathogens de spite its excellent pharmacological effects.

Studies designed to identify solutions to anti biotics resistance and undesirable side effects have often focused on novel agents against oral pathogens from diverse sources including edible plant extracts and the essential oils of herbal plants (Shin et al., 2002; kyung et al, 2007; Choi et al., 2008).

Mustard has antibacterial activity against oral bacteria such as porphyromonas asaccharolytica, p.gingivalis, streptococ-cus mutants and s. sobrinus (Hyung Wock Kim, Chi Hoon Lee, Min-Gikim and Hoi-Seon, 2009).

So major oral health problems include dental caries and periodontal diseases which cause tooth loss (Tsai et al., 2006). Both can be effectively prevented and controlled by an effective plaque control method. Daily plaque removal with tooth brush is an important

component of most oral hygiene programs intended to prevent and treat periodontal diseases.

No single agent can perfectly get rid of dental plaque this study was conducted on white mustard sinapis alba seeds which belong to Brassiaceae family as anti bacterial plaque agent. However, relatively few studies have been conducted to evaluate the activity of s.alba seeds against oral pathogens despite its excellent pharmacological effects. Therefore we conducted this study to find natural mouth wash against oral microorganism .

MATERIAL AND METHOD

This study was conduct on white mustard scapis alba seeds ,the seeds were obtained from college of agriculture ,Baghdad university. The chemical and biological studies were obtained on it. While clinical application where obtained in college of dentistry university of Baghdad. The bioactivity assay included preparation of three extracts of mustard seeds were watery extracts “different degree of extraction, 5, 10, 15%” “at 40°C degree” 30 subjects “male and female” age range between 35-55 years old were renuted for 15 days study, having at least 20 natural teeth, with gingivitis or periodontitis with moderate plaque accumulation (Himdan et al., 2008) ,each group 10 subject.

There aren’t having any sign and symptom for any disease or allergy or using any drug or medication.

Oral prophylaxis was not performed so that the subjects began the treatment regimen with their normal existing level of plaque deposits.

All subjects were instructed to continue their normal home oral hygiene procedures, along with mustard water solution, all subjects had to perform their routine morning mustard rinse, and at night after meal, take 15 ml hold it in his mouth for 15 min till the subject feel a fullness in his mouth. “water extract” “40°C degree” with different concentration . the subjects were called for 3 subsequent visits space (5

days) apart. At each visit, plaque and gingivitis scores were assessed the mean of gingival index and plaque index by (Loe and Sillness 1963) was used to assess the severity of gingivitis of all teeth present.

RESULTS

The presents study was conducted to assess the dental effect of mustard on plaque and gingival indeces.

Table 1: comparison of plaque scores between base line and 5, 10, 15, day

Period of days	Mean	SD±
Base line	6.9	0.4
5 day	6.7	0.2
Base line	6.9	0.4
10 day	6.2	0.6
Base line	6.9	0.4
15 days	5.2	0.7

Table 2:comparisom of plaque index score due to different concentration

Concentration	Mean	SD±
5%	3.4	0.3
10%	3.0	0.3
15%	2.6	0.35

There was a decline in mean of plaque scores decline in plaque scores at 5 days was not significant from base line to 15 days p value 0.01 thought the the rest of the differences were highly significant.

Table 3: comparison of gingivitis score between base line and 5, 10, 15 days.

Period of days	Mean	SD±
Base line	1.4	0.6
5 day	1.1	0.5
Base line	1.4	0.6
10 day	0.8	0.4
Base line	1.4	0.6
15 days	0.8	0.4

Table 4: comparison of gingivitis score due to concentration

Concentration	Mean	SD±
5 %	1.2	0.4
10 %	0.9	0.4
15 %	0.6	0.3

The decline in gingivitis was 0.001 significant which is more than 50%.

## DISCUSSION

The periodontal disease and dental caries was the big problem in dental health the mean cause was dental plaque the use of antibiotic was contraindication in periodontal disease so the use of mouth wash to decrease dental plaque is recommended chemical mouth wash have many side effect and we can not used for long time ,so natural herbs or seeds newly used as mouth wash. Since there are no studies till date assessing the dental benefits of mustard on dental health but when compared to tooth brush and mouth rinses it have also resulted in a significant important in oral hygiene.it can't be considered as a replacement of tooth brush but can be supplement oral hygiene aid.It emerges that this study an individual is able to maintain low level of plaque and gingivitis even if performing 15 days. This agree with few study on the activity of sinapis alba seeds chem et al,2009. also agree with studies designed to identify solution antibiotic resistance and undesirable side effects have been focused against oral pathogen from sources including edible plant extracts and the essential oil of herbal plant (shin et al.,2002;choi et al.,2008).this is also agree with Korean study "VanOosen et al .,1987; song et al .,2006,Rajauo et al.,2007'.

Chlohexidine mouth wash have been widely used as clinical adjunct in the treatment of both caries and periodontal disease providing gold stander by which to assess the efficacy of other topically applied agents .it has discourage compliance because of its unpleasant taste and undesirable side effects ,no such adverse reaction were noted during this study. So the effect of mustard was obvious inhibition of plaque

bacteria which cause gingivitis and this agree with Hyung Wook et al, 2008.

So water extract at 40°C degree of mustard had effectiveness to inhibit bacteria and still have inhibition activity against bacterial test in spite of strong for 3 months under cooling Himdan et al., 2008.

So further longitudinal research is needed with larger sample size should be conducted .

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## Prevalence of Prosthodontic Appliances Replacement in Erbil City

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### ABSTRACT

**Background and objectives:** to determine the prevalence of prostheses requested by Erbil city, prosthesis is an artificial substitute that replaces the missing part.

**Material and Methods:** totally 405 people aged 30 - 79 years were randomly taken as source of data in Erbil population; the chart was filled up in an interview then managed statistically. Several types of data were obtained to reach the most appropriate decision.

**Results:** The persons were subdivided in to dentate (28.15 %) and edentulous (71.85 %), the edentulous fall in to two categories, with appliances (47.1%) and without appliances (52.9%) were the with appliance are subdivided to; implant (1.72%), bridge (13.33%), partial denture (13.58%) and complete denture (6.17%), The main reason for non seeking replacement was education (65.58%).

**Discussion:** Edentulism is considered one of the most common problems in the word, Erbil city is one of these cities.

**Conclusions:** The results shown that persons who don't wear appliance are more than those who wear it and education factors are the reasons for its rejection.

Key words: **edentulous, tooth, prevalence and prosthesis.**

### INTRODUCTION:

Oral health is an important and often overlooked component of an older person's general health and well-being, in the words of former Surgeon General C. Everett Koop: "You are not healthy without good oral health"<sup>(1)</sup>. Oral health can affect general health in several ways and can cause pain and suffering as well as difficulty in speaking, chewing and swallowing<sup>(2)</sup>. Edentulism can have obvious negative esthetic and functional (speech, chewing/eating) consequences, among American population in 1993 one-third of noninstitutionalized adults aged 65years and above, reported that they having lost all their natural teeth<sup>(3)</sup>. The institutionalized persons are more likely to have serious oral health problems than noninstitutionalized elderly persons<sup>(5)</sup>. About 25% of all adults aged 60 years and older have lost all of their teeth<sup>(6)</sup>. More specifically, 20.5% of adults in the U.S. aged above 64 have lost all of their natural teeth due to tooth decay or gum disease<sup>(7)</sup>. Loss of all teeth causes disability for most people who wear conventional dentures because they have difficulty performing two of the essential tasks of life, eating and speaking, near (15%) of low-income adults (i.e., less than 100% of the federal poverty level (FPL) have lost all of their teeth compared with only 5% of people with higher incomes (i.e., more than 200% of the FPL)<sup>(8)</sup>.

Loss of teeth occurs most often as a result of two common diseases affecting the American people (dental decay and periodontal) during the life time nearly every person has one or both of these ailments and when treatment is too long delayed<sup>(9)</sup>. In 2007 to 2009 among Canadian adults aged 20 to 79 about 93.6% had some natural teeth and 6.4% were edentulous; that is they had no teeth of their own when examined by a dentist<sup>(10)</sup>. In a survey done in England by Sheiham et al(1985) among a random sample of 512 people selected form employees of two industrial

plants. They concluded that 87% were dentate and 13% edentulous<sup>(11)</sup>.

In a Chinese study conducted by Lind et al (1987) as a form of clinical examination and questionnaire the result was that having no dental problem was the most frequent reason given by both age groups for never having visited a dentist and between 82% to 89% of all the respondents considered old age to be a cause of tooth loss<sup>(12)</sup>. Edentulism rates were 10% to 15% lower than those found a decade earlier in national health surveys only 7% of the edentulous people felt they needed to visit a dentist, even though 70% had not seen one for over five years<sup>(13)</sup>. In a study published by an Iranian author, the results of the studies identified the prevalence of tooth loss ranges between 0.3% in 3 to 5-year-old children to 70.7% in adults over 65; there was a lack of well-designed epidemiological studies on edentulism and tooth loss in Iran<sup>(14)</sup>.

The percentage of men and women who have lost natural teeth or who are wearing dentures are 59% of men and 64% of women. Loss of some natural teeth increases from about 32% in the younger age groups to about 90% in the older age group, 7% of men and 9% of women reported being edentulous, having lost all their natural teeth; as expected edentulousness increases with increasing age, total tooth loss in the age groups 35-44 was below 10% whereas in the age groups 65 years or above about a quarter of the participants had no natural teeth, 10% of the men and 12% of the women report that they wear dentures, the percentage of denture wearers increases with increasing age<sup>(15)</sup>.

Edentulous state is considered as a social psychological catastrophe by the majority of people. Replacements by artificial substitutes such as prosthesis are necessary. Many materials and techniques for fabrication had been employed for construction of



dentures<sup>(16)</sup>. In a study by Ehikhamenor et al ( 2010) the authors found that the total number of 351 cases were edentulous spaces restored in these patients were Kennedy's class III (57.3%), Kennedy's class IV (26.2%), Kennedy's class I and II (0.9%), Kennedy's class III with modifications (5.7%), Kennedy's class II with modifications (1.4%), Kennedy's class I with modifications (1.7%) and complete dentures (6.0%), the main reason for seeking replacement was aesthetics (89.2%)<sup>(35)</sup>.

Erbil City is the capital of Kurdistan Region with population about 980,000<sup>(18)</sup>. In Erbil City there is no published study about the prevalence of prosthesis and there is no official data available which is necessary for study. The present study is an attempt to find out the prevalence of prosthesis used among population of Erbil City and to identify the most frequent used types.

#### MATERIAL AND METHOD

The Statistical Population was Erbil City, the data collected from August till October 2012; the sample size was 405 people that were taken as a source of data by stratified random sample in Erbil, from those who was aged 30 - 80 years, type of study was retrospective study. For data collection, Erbil was subdivided according to that each health center control area that visit it during vaccination expedition, the data collected when had a vaccination expedition of poliomyelitis in Erbil City. Obviously after we gained the approval from directors of Erbil Health, we visited the health centers of each area then cooperation done between us and health group. We together visited each area to fill the chart that contained the data; the data was taken from person after he/she accepted to join the program, to be taken in a face to face interview, the inclusion criteria are all adult were they are 30 - 79 years, persons randomly chosen until the sample are completed, those people who rejected to participate in the program were excluded.

The loss of 3<sup>rd</sup> molar due to any cause were excluded and considered dentate, closed end and open end questionnaire was used for data collection from each selected people. The data collected included socio-demographic information such as; sex, age, occupation, type or area of occupation, certification, dwelled or homeless, regular visit to dentist in public clinic or private clinic, edentulous space to be restored, the cause of tooth loss then number of teeth that were missing, the type, number, satisfy and cause of failure of the prosthesis which was used to restore the edentulous area if present and finally the cause that made the persons not to chose any

prosthesis appliances if he/she did not have appliance, even he/she had edentulous area. Data like drifting, malposition and abnormal tooth was collected after oral examination to know the number of teeth that absent in the oral cavity. The data of chart was coded, entered and tabulated then organized after that it was managed statistically by descriptive statistical procedure. Statistical package for social sciences version (16.0) software was used for data entry and analysis, aided by office 2007 for calculation and tabulation.

#### RESULTS

Statistical analysis methods were used in this study and it was analyzed by using the statistical package for social sciences version (16.0.) presented as a simple frequency table. A total of 405 people were seen during the study period. The samples are grouped with length of 5 and starting from 30 years onwards. Mean age of the population was (mean  $\pm$  SD = 45.1  $\pm$  11.26) years, 175 (43.21%) male and 230 (56.79%) female, therefore male to female ratio of 1:1.3143, Were the minimum age are 30 years and the older one are 77 years; range 47 years. About certification of persons are as follow; 129 (31.85%) with no certificate, 173 (42.72%) below diploma and 103 (25.43%) above high school. About the occupation of the person are 178 (43.95%) employer and 227 (56.05%) not employer. About clinic attendance for dental problems 363 (89.63%) of them visit public health center and other 137 (33.83%) visit private clinic, as shown in Table 1.

About tooth loss 28 (9.62%) person completely edentulous, 6 (1.48%) loss more than 20 teeth, 16 (3.95%) loss between 10 - 19 and 241 (59.51%) loss less than 9 teeth and 114 (28.15%) are dentate, the 48 (19.8%) person loss 2 teeth that is the highest number of teeth loss. The causative factors for teeth missing are 74 (19.7 %) due to periodontal problem and 235 (62.5%) due to caries and 5 (1.3 %) of them due to trauma 61 (16.2%) due to combination between periodontal problem and caries while 1 (0.3 %) due to combination between caries and trauma, as shown in Table 2.

The case dentate or not was divided to 114 (28.15%) dentate and 291 (71.85%) are not dentate and need for an appliances this was subdivided to completely edentulous 28 (9.62 %) case and partially edentate 263 (90.38 %), the 28 case was restored with denture in 25 (6.17 %) persons and 3 reject the dentures were all rejection due to economic factors. About partially edentulous case 263, 154 (58.55 %) of them reject appliances and 116 (44.11 %) were

who restored, 55 (13.58%) of them partial denture the rate of denture construction are (44 person 1<sup>st</sup> time, 10 person 2<sup>nd</sup> and 1 person 3<sup>rd</sup>), 54 (13.33%) person having bridge (47 person 1<sup>st</sup>, 4 person 2<sup>nd</sup> and 3 person 3<sup>rd</sup>). about implant replacement only 7 (1.73%) cases, were some of these persons had more than one type of appliances; the 154 (58.55 %) who reject

Table 1 Shows distribution of person's age group according to gender, certification, occupation and dental seeking for any cause.

Age group	gender frequency				Certification			Occupation		Dental visit		
	Male	Female	Total	Percentage	No	Less than diploma	Higher than high	Employer	Not employer	public clinic	Private clinic	Not attend
30-34	29	47	76	18.80	11	34	31	44	32	71	15	1
35-39	41	39	80	19.80	15	39	26	42	38	72	29	1
40-44	25	38	63	15.60	18	32	13	28	35	60	17	1
45-49	26	25	51	12.60	9	25	17	28	23	41	22	1
50-54	12	23	35	8.60	18	11	6	10	25	32	10	2
55-59	19	27	46	11.40	22	17	7	14	32	40	21	0
60-64	14	12	26	6.40	15	10	1	7	19	21	12	1
65-69	4	10	14	3.50	11	3	0	1	13	13	4	0
70-74	3	6	9	2.20	8	0	1	2	7	8	5	0
75-79	2	3	5	1.20	2	2	1	2	3	5	2	0
Total	175	230	405		129	173	103	178	227	363	137	7

Table 2 shows the distribution of person's age group according to dental status

Age group	Edentulous	> 20 teeth missing	10-19 teeth missing	<9 teeth missing	total	%	Dentate
30-34				32	32	11.00	44
35-39			2	47	49	16.80	31
40-44			2	47	49	16.80	14
45-49	3		1	34	38	13.10	13
50-54	4	1	2	23	30	10.30	5
55-59	6	2	2	31	42	14.40	4
60-64	7	2	4	13	25	8.60	1
65-69	3	1	2	7	13	4.50	1
70-74	2		1	6	9	3.10	0
75-79	3			1	4	1.40	1
Total	28	6	16	241	291	100.00	114

Table 3 Shows the distribution of prosthesis according to the age group

Age group	Case		Case with missing teeth		Dentate		Having complete denture		Having partial denture		Having fixed bridge		Having implant		Reject prosthesis even its necessary			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	Education	economic	No.	%
30-34	76	18.8	32	11.00	44	10.86	0	0.0	2	3.6	3	5.6	1	14.3	16	11	27	17.5
35-39	80	19.8	49	16.80	31	7.65	0	0.0	3	5.5	10	18.5	3	42.9	24	9	33	21.4
40-44	63	15.6	49	16.80	14	3.46	0	0.0	6	10.9	12	22.2	1	14.3	19	11	30	19.5
45-49	51	12.6	38	13.10	13	3.21	1	4.0	7	12.7	13	24.1	1	14.3	10	7	17	11.0
50-54	35	8.6	30	10.30	5	1.23	3	12.0	8	14.5	7	13.0	0	0.0	9	3	12	7.8
55-59	46	11.4	42	14.40	4	0.99	6	24.0	13	23.6	9	16.7	1	14.3	9	5	14	9.1
60-64	26	6.4	25	8.60	1	0.25	7	28.0	8	14.5	0	0.0	0	0.0	8	3	11	7.1
65-69	14	3.5	13	4.50	1	0.25	3	12.0	3	5.5	0	0.0	0	0.0	5	2	7	4.5
70-74	9	2.2	9	3.10	0	0.00	2	8.0	4	7.3	0	0.0	0	0.0	1	2	3	1.9
75-79	5	1.2	4	1.40	1	0.25	3	12.0	1	1.8	0	0.0	0	0.0	0	0	0	0.0
Total	405		291	71.85	114	28.14	25	6.17	55	13.58	54	13.33	7	1.72	101	53	154	58.55

DISCUSSION:

Erbil must have this type of data if compared with other cities in the world because it is the capital of Kurdistan Regional Government (KRG)-Iraq and it is a city with population near million (18). The current study likes the studies done in Helsinki (17), Oslo (19), Khartoum (20), Oman (21), Hamburg (22).Therefore this study gives the official data about Erbil City.

The present study give some results better to discuss it; the dentate persons (28.15%) among 405 people were aged above 29 years give impression of that there is defect in public and personal health care, also the persons without appliances even its necessary were (52.9%) give abad news were it clarify that however the public and social health care are so bad but the persons did not considered the health of oral cavity problem , at the same time (13.58%) partial denture wearer give the that impression of that the patient seeking for cheap treatment rather than best treatment.

According to Winkler, (1977) almost 50% of the 22.6 million edentulous Americans were 65 years of age or older (26). In our finding we observe that 50% of 405 sample loss one or more teeth above age of 45 years, so there is a difference in result which may be due to statistical population.

Lesmasney (1984) in a Cross-sectional study in Ireland among 368 in stitutionalised persons were aged 58–99 prevalence of edentulisim 78% and 27%

of edentulous persons used complete dentures (30). In our finding 9.62% edentulisim and 89.29 % of them using complete denture. Slight disagreement is due to that the author selected different age group than our study, type of person’s where he select institutionalized elderly people and the data was collected by him in health center.

According to Hunt et al (1985) about 40% had dentures that were over 20 years old, with half of these being over 30 years old. Many dentures were loose and causing soreness in the mouth or difficulty in eating (13). Our finding was 34.81% there is slight disagreement because age group of author and statistical population he select elderly rural Iowans. According to U.S. Dep. of Health and Social Services, Oral Health of United States (1987), a parallel study spanning 1985–1986 in the United States reported that 41% of adults over the age of 65 were edentulous (25). Were our findings are 26.67% and the disagreement is due to statistical population which is American population. However 18% did not usually use them (4). Were our findings are 26.67% and the disagreement is due to statistical population.

Angelilo, (1990) found edentulous 59.8% and 44.3% of edentulous persons wore complete dentures (31). We find that 9.62 % completely edentoulous and 89.29 % of them wearing denture the disagreement due to aged were mean are 81.4years and type of patient. Tobias, (1990) conclude that 24% of

edentulous persons did not own complete dentures (32). Our finding is 10.71 % of edentulous did note wear denture; this may come from age, type of patient. Todd and Lade(1991) concluded that the overall percentage of adult who were edentulous fell from 30% in 1978 to 21% in 1988 among England and Wales population(24).In our finding related to this subject are 71.85% there is disagreement between our finding and Todd and Lade’s finding, this is because of the statistical population.

Nitschke (2000) in Germany, Rural Cross-sectional study were aged 51–99were 2.4% had neither teeth nor dentures (33). In our finding 10.71 % are completely edentulous and reject the denture. According to DHS (2001) the percentage of denture wearers increases with increasing education, whites have the highest likelihood of wearing dentures followed by colored and Asians, the nonurban African community has the lowest rate of wearing dentures (15).

Marti, (2004) conclude that the fixed prosthesis was more used in female than in male; there is some disagreement with this result it came from age of the samples (17). Gadeer, (2004) among the 200 patients were aged 65 years and above, 28% completely dentate excluding the third molars while 72% were completely edentulous (29). But in our finding 28.15 % completely dentate and 72.85 % completely edentulous and this difference came from age of samples and the fact that the people visited a prosthetic clinic in the medical center.

Poul et al (2004) in a study among Danish city population was statistical population ranging between 16-75 years found that 8 % were edentulous while 80% lost less than 10 teeth about this finding our finding were 9.62% and 59.51 %, this simple disagreement is because that the age group, but at the age 67-74 years 27% edentulous 40% lost less than 10 teeth our finding are 28.6% edentulous and 55% loss less than 10 teeth; 58% are worn removable denture were in our finding are 52% worn removable denture and about edentulous who reject the appliances use come due to education and economic factors,80% of interview had regular visit to dental seeking(23). There is slight disagreement between us and this finding this is because the statistical population of Danish, sample collection who attend center and age group.

In the study done in Netherlands by Frans, (2005) among who aged 16 years and older, 67% with no denture, 14 % having single denture, 14 % having bridge or partial denture and 5% with complete denture (28), about this observation we found that 53.95 % with no denture , 13.33 % having bridge 13.58 %

having partial denture, 6.17 % with complete denture. There is some disagreement with our finding because of age group starting from 16 years and older.

Adam, (2006) in his study in the United Kingdom in demented group aged 85.5 find 63% edentulisim and 40% of them used denture. While in not demented person 80.8 ages find 70% edentulous and 90% were used denture (34), our finding are 9.62 % edentulisim and 89.29 % of them used denture. According to The NHS Information Centre (2010), 94 % of adults in England, Wales and Northern Ireland were hade tooth or more (27), while in our finding 71.85 % are having tooth or more also 86 % of dentate adults had 21 or more natural teeth(27), in our finding it was 93%. According to saber et al (2012) the prevalence of tooth loss is high and it increases by aging. He concluded that it seemed that the prevalence of tooth loss was high among adults in Iran, and it was highly suggested that population based studies should be established to investigate the epidemiology and risk factors of tooth loss in Iran (14).

CONCLUSIONS:

Among Erbil City population (randomized stratified sample) shows the following conclusions:

28.15% of samples are completely dentate while 9.62 % are completely edentulous and among them 34.81 % wearing prosthodontic appliances. 53.95 % not wearing any kind of appliances even its necessary for him, rejection of appliance due to 34.42% economic factors and 65.58% due to educational factors.

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## Determination of Acrylic Denture Resin Surface Roughness by Different Processing Techniques

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### ABSTRACT

**Background:** Poly (methyl methacrylate) (PMMA) seems to be the most commonly used material in the construction of denture base due to its advantages. However, it is still far from being ideal in fulfilling the physical and mechanical properties. Therefore, attempts to improve the properties of PMMA were taken by the researcher through many ways. The purpose of this study was to estimate the effect of different processing techniques on surface roughness of acrylic base denture resin.

**Materials and Methods:** A total sample of (50) specimens were prepared; these specimens were divided into 3 main processing techniques, and 5 experimental sub-groups (n=10): Group (A), acrylic denture base material processed by conventional water bath technique (74°C for 1 and half hours then boiled for 30 min; Group (B), acrylic resins processed by microwave oven at (500 Watts) for 3 min; Group (C) samples processed by autoclave device with 3 different timing set up : (C1) for 10 min, (C2) for 20 min and (C3) for 30 min. This is done to make a comparison of different autoclave polymerization conditions on the surface roughness of denture base resin.

**Results:** Statistically, there was no significant difference between the traditional water bath group technique and an autoclave system when the specimen processed at (121°C/210Kpa) for 30 min. However, there was a statistically significant difference compared to other experimental groups.

**Conclusion:** The autoclave processing technique could be the new alternative system to process the acrylic resin base material alongside the conventional methods. The experimental group prepared by autoclave system at (121°C/21Kpa) for 30 min showed an improvement in the surface roughness compared to microwave and water bath techniques.

**Key Words:** acrylic, processing, surface roughness, denture resin

### INTRODUCTION

Poly (methyl methacrylate) (PMMA) is the most commonly used material in the construction of denture base since 1936. This material is not ideal in every respect; it is the combination of various rather than single desirable properties that account for its popularity and usage<sup>(1)</sup>.

Despite its popularity to satisfy simple, aesthetic processing and easy repair is still far from ideal in fulfilling the mechanical requirements of prosthesis. In an attempt to improve the physical and mechanical properties of poly (methyl methacrylate), the researcher used several ways<sup>(2)</sup>, and the vast majority of denture made today are fabricated from heat cured acrylic poly (methyl methacrylate)<sup>(3)</sup>. Over the years, curing procedures have been modified with a view to improve physical and mechanical properties of resin material. Different polymerization methods have been used such as heat, light, chemical and microwave energy<sup>(4)</sup>. Nevertheless, the water bath processing technique is the most conventional polymerization technique used. In spite of being simple and easy, the processing time of this method is long<sup>(5)</sup>. However, no studies have been conducted to investigate the effect of varied autoclave polymerization conditions on the final properties of acrylic resin. Nevertheless, few researchers investigated the effect of different time durations of autoclave application on the transverse strength of two denture base resins<sup>(6,7)</sup>. Therefore,

the aim of this study was to investigate the effect of autoclave processing technique on roughness of acrylic denture base material processed by different durations.

### MATERIALS AND METHODS

#### Mold Preparation:

Several brass patterns were constructed in a form of a disc with 15 mm diameter and 4 mm thickness metal<sup>(8)</sup> as figure (1) shows.

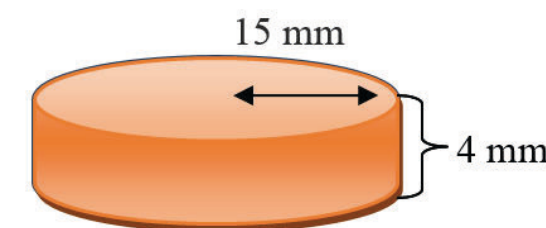


Figure (1): Mold dimension

Patterns were coated with separating medium (Isodent, Europe) and allowed to dry. The lower portion of the dental flask (Brodin, Sweden) was then filled with dental stone (Bluejey, Italy) (mixed according to the manufacturer's instructions), and the patterns were invested into the stone mixture; they were inserted to one half of their depth. After setting, both the stone and the metal surfaces were coated with separating medium. The upper half of the flask was then positioned on the top of lower half and



filled with stone. Later on, the flask was opened, the metal patterns were removed, and the two halves of the mold were coated with separating medium to be ready for packing the acrylic.

### Mixing and Packing of Acrylic

Heat cure acrylic denture base resin (Major, Italy) was used to fabricate the samples in this study. It was mixed according to manufacturer's instructions of powder/liquid ratio by volume (3:1). The acrylic resin were packed in the late dough stage (indication by the clear separation of the resin from the walls of glass mixing jar)<sup>(9)</sup>. Then acrylic resin dough was rolled and placed in the mold and trial closure was done by using the polyethylene sheet. The two halves of the flask were assembled and placed under the hydraulic press (Germany) with gradual application of pressure up to 100 Kpa. This was done to allow even flow of the dough throughout the mold space, then the press was relived, the flask was then opened and the over flowed materials flashes surrounding the flask borders were removed with a sharp knife. The second trial closure was performed, then the polyethylene sheet was removed and the stone surface was recoated with separating medium. Finally, the two halves of the flask were closed under pressure of 4 bars (120 Kpa) until metal to metal contact had been established and left under pressure for 5 min, then the flasks were clamped to keep intimate metal to metal contact under curing system.

### Curing of Acrylic Resin by Water Bath:

For control specimens, curing was carried out by placing the clamped flask in a water bath (Germany) and processed by heating at 74 °C for about one hour and a half, and then the temperature was increased to 100 °C for (30) minutes<sup>(10)</sup>, finally the flask was allowed to cool slowly at room temperature for 30 minutes followed by complete cooling of the flask with tap water for 15 minutes before deflasking.

### Curing by Microwave

The microwave energy was used in this study (Samsung, Korea) as experimental group technique to polymerize the PMMA resin material. The short cycle of 500 watts for 3 minutes was used for this study, and then the flask {fiber reinforce plastic (FRR) flask (Kimura type)} was left for 30 minutes for bench cooling<sup>(10)</sup>.

### Curing by Autoclave

Curing was carried out by placing the clamped flask in a fully automatic autoclave (LS-B75L, Indian)

and processed by the preprogrammed cycles (121 °C /210 KPa, 10 min, 121 °C /210KPa, 20 min and 121 °C /210 Kpa for 30 min).

A fully automatic autoclave (LS-B75L, Indian) was filled, sterilized and exhausted at the touch of a button. The autoclave was pre-set with five standard programs (from manufacture) that can be customized by authorized personnel to suit individual requirements. These three standard programs were (10 min, 121 °C and 20 min; 121 °C and 30 min, 121 °C). In this research, the autoclave used to cure the heat cure acrylic denture base resins (conventional acrylic) and selected only three standard programs (10 min, 121 °C and 20 min, 121 °C and 30 min, 121 °C) for using as a curing cycle. The clamped flask was placed in the tray and pushed inside the **chamber**, then closed and secured the door. In the control panel, hold the start button and select only three standard programs (10 min, 121 °C and 20 min, 121 °C and 30 min, 121 °C) for using as a curing cycle<sup>(11,12)</sup>.

### Autoclave Processing Curing Cycle with Different Duration:

In this cycle, the program was selected with three different duration. These are for 10, 20, and 30 min at (121 °C). The stages of operation in autoclave include air removal; steam admission; and sterilization cycle. In addition, these involve heating up, holding up, exposure, and cooling steps. The autoclave system when operated started to heat the water, then the temperature and pressure were raised till it reached (121 °C and 210 KPa), respectively. At (121 °C), the temperature and pressure for one of the experimental groups were automatically fixed for 10 min, while the two other groups were held for 20 and 30 min. Then automatically exhausted the steam and the programmed cycle were finished. The door was unsecured and opened, and the clamped flask was removed<sup>(11, 12)</sup>.

Finally, the metal flask was allowed to cool at room temperature for 30 min, followed by complete cooling of the metal flask with tap water for 15 min before deflasking when the acrylic patterns were removed from stone mold<sup>(13)</sup>.

### Roughness Surface Test (Pocket Surface):

Pocket surface roughness tester (Maher, U.S.A.) was used to study the surface roughness of acrylic resin. 50 specimens were placed on bench under the analysis arm of the device (stylus) and this stylus in contact with specimen's surface passed along the length of the specimen which moved for a distance of 15mm according to apparatus design. The data collected and the number from screen part of device

represented as surface roughness value that was measured in micrometer (Figure 2).



Figure (2): Pocket surface

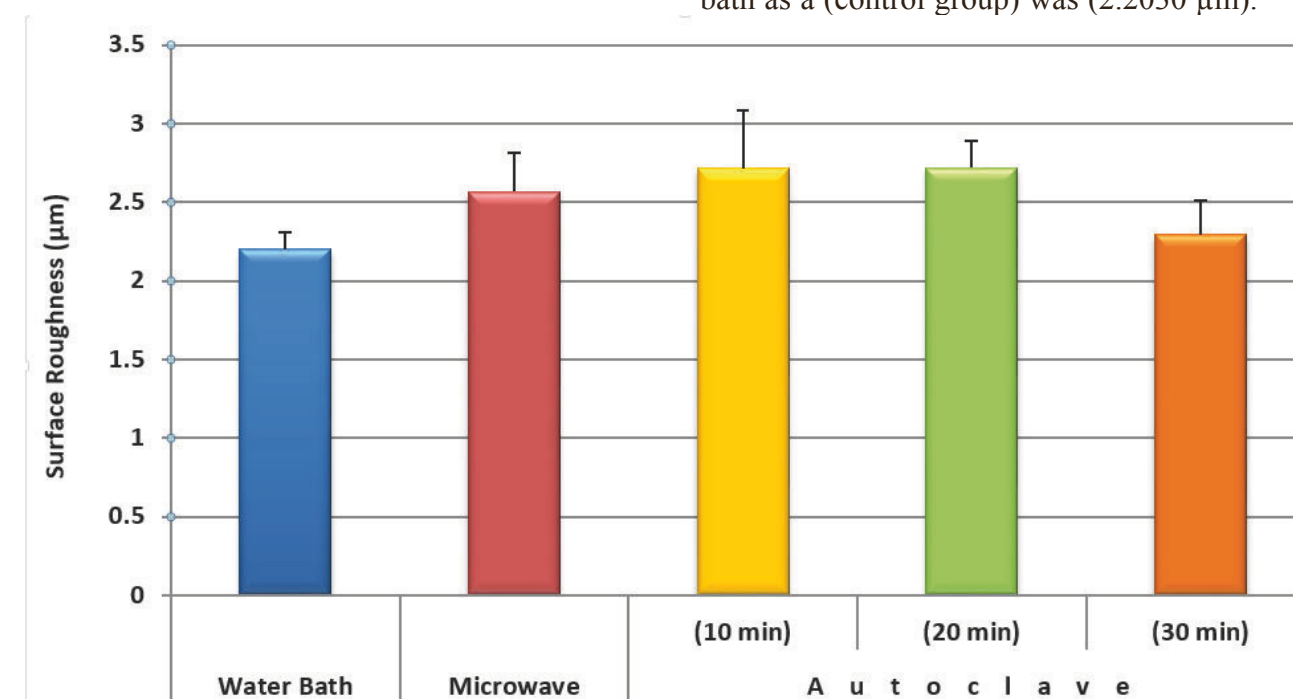


Figure (3): The mean of surface roughness, among studied groups (water bath, control group, microwave and autoclave)

Table (1): Descriptive data of roughness surface results.

Measurements	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
Water Bath	10	2.2030	.10945	.03461	2.02	2.39
Microwave	10	2.5700	.24299	.07684	2.20	2.90
Autoclave (10 min)	10	2.7150	.36788	.11634	2.08	3.20
Autoclave (20 min)	10	2.7190	.17104	.05409	2.39	2.90
Autoclave (30 min)	10	2.2930	.21628	.06840	2.18	2.90
Total	50	2.5000	.31438	.04446	2.02	3.20

Table (2) represents one way ANOVA by LSD multiple comparison test (Least significant

difference), showed that there was a significant difference at (P<0.05) between different types of processing methods, except a non-significant difference at (P>0.05) between water bath (control group) and autoclave (30 min), microwave and autoclave (10 min and 20 min), and autoclave 30 min with autoclave 20 min.

Table (2): (ANOVA by LSD) least significant difference test between groups.

Processing Methods		Sig.
Water Bath	Microwave	S.
	Autoclave (10 min)	S.
	Autoclave (20 min)	S.
	Autoclave (30 min)	N.S
Microwave	Water Bath	S.
	Autoclave (10 min)	N.S
	Autoclave (20 min)	N.S
	Autoclave (30 min)	S.
Autoclave (10 min)	Water Bath	S.
	Microwave	N.S
	Autoclave (20 min)	N.S
	Autoclave (30 min)	S.
Autoclave (20 min)	Water Bath	S.
	Microwave	N.S
	Autoclave (10 min)	N.S
	Autoclave (30 min)	S.
Autoclave (30 min)	Water Bath	N.S
	Microwave	S.
	Autoclave (10 min)	S.
	Autoclave (20 min)	S.

P< 0.05= S. significant differences  
P> 0.05= N.S non-significant differences

DISCUSSION

An autoclave is a pressurized device designed to heat aqueous solutions above boiling point to achieve sterilization. It was invented by Charles Chamberland in 1879<sup>(14)</sup>. From the result of the present study, statistically there was a significant difference with all types of the processing methods. This caused when the acrylic resin material was subjected to autoclave polymerization increase occurred in surface roughness of tested groups when compared with control group at (10 min) and (20 min), while no significant difference

with autoclave at (30 min) this was due to the pressure. The pressure played an important role in speeding up the initial polymerization and elevating the boiling temperature of the monomer and prevented its vaporization during the exothermic polymerization of acrylic resin and thus might have reduced the residual monomer content<sup>(15)</sup>. The pressure required steam to reach 121 °C (250°F). Over pressure protection was provided by a safety valve. The condition inside were thermostatically controlled so that heat (more steam) was applied until 121°C is achieved, at which time the

timer started and the temperature was maintained for the selected time<sup>(11)</sup>, the curing cycle at polymerization temperature of 70 °C followed by a period at 100°C significantly reduced the residual monomer content of the polymer, when compared with resin cured at 70 °C only<sup>(16, 17)</sup>. One study has been reported that curing cycle includes long terminal boiling period shows significantly better physical and mechanical properties<sup>(18)</sup>.

On the other hand, this study showed that there was no significant difference between the microwave and the autoclave in (10 min) and (20 min); there was a significant difference in (30 min). This was due to the effect of microwave energy on the porosity of a heat-cured denture base resin; it was found that the resin designed especially for microwave curing exhibited no clinically significant porosity<sup>(10)</sup>. However, the shortage in researches on the uses of the autoclave for the processing of acrylic resin for denture base purposes needs more investigation in the future.

CONCLUSIONS:

This study concluded that:

- 1.The autoclave could be a novel alternative processing technique for acrylic base resin.
- 2.There were no significant differences between water bath processing techniques in roughness surface of denture base material and the autoclave processing technique in (30min).
- 3.The sample processed by an autoclave (121 °C/ 210Kpa) for 30 min improved roughness surface for denture base material compared with (10 min) then (20 min) curing.

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# The Effect of Time on Orthodontic Mini-Screw Implants Stability (An experimental study)

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## ABSTRACT

**Background:** Mini-screw implants have become an accepted and reliable method for providing orthodontic anchorage. The present study aimed to measure the primary and secondary stability of mini-screw implants using the removal torque value as indicator for the stability and comparing between four different periods of mini-screw implants removal (Immediate, 2 weeks, 4 weeks and 6 weeks).

**Materials and Methods:** Forty mini-screw implants, all of the same manufacture, length (7 mm), diameter (1.4 mm) and of cylinder type, were implanted in the tibia bone of two sheep (ten in each tibia) after anesthesia and flap reflection using drilling burs. The insertion torque were standardized and equalized for all mini-screws. Mini-screw implants were removed after different periods of time (immediately, 2 weeks, 4 weeks and 6 weeks) using digital torque screw driver (DID-4). One-way ANOVA test was used to compare among the groups.

**Results:** The results showed that mini-screw implants stability significantly decreased during the first two weeks then started to increase during the four and six weeks.

**Conclusions:** It was concluded from this study that mini-screw implants stability is affected by the period of implantation, decreased during the first two weeks and then started to increase.

**Keywords:** MSI (Mini-screw implant), DID4 (digital insertion torque screw driver, Stability, Torque).

## INTRODUCTION

Mini-screw implants (MSIs) have become popular means of providing skeletal anchorage in orthodontics <sup>(1)</sup>. Terms such as mini-implants, mini-screws, micro-implants, and micro-screws have been used to describe the devices for skeletal anchorage <sup>(2)</sup>. Screws can be described as having four distinct yet contiguous segments or zones: body, collar, neck and head <sup>(3)</sup>.

In 1960s, Brånemark *et al.* noticed the biocompatibility of titanium screws in bone tissue. Light microscopic examinations showed bone-to-implant contact; thus, the concept of "osseointegration" developed. Osseointegrated implants circumvented many of other anchorage shortcomings <sup>(4,5)</sup>.

Implant stability immediately after insertion is called primary stability. Due to osseointegration, an implant gains secondary stability which can be determined after the healing phase or at the end of its use period <sup>(6)</sup>. Stability, an indirect indication of osseointegration, is a measure of implant's resistance to movement <sup>(7)</sup>.

The reverse torque test was first proposed by Roberts *et al.* <sup>(8)</sup> and developed further by Johansson and Albrektsson <sup>(9)</sup>. It measures the critical torque threshold when the bone-implant contact is broken. Removal torque provides information on the degree of bone-to-implant contact in a given implant.

The present study aimed to measure the primary and secondary stability of MSI using the removal torque value as indicator for the stability and comparing between four different periods (Immediate, 2 weeks,

4 weeks and 6 weeks).

## MATERIALS AND METHODS

### Sample

#### Mini-screw implants

Forty mini-screw implants, their raw material is Titanium alloy (Ti6Al4V). These are of Absoanchor®, Dentos, Taegu, Korea. All had the same length (7 mm), same diameters (1.4 mm) and of cylinder type (Figure 1).

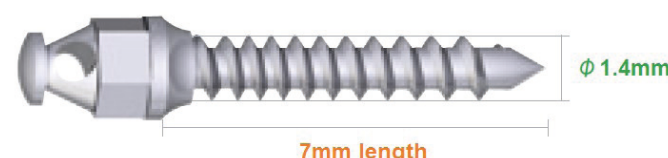


Figure 1: Dentos mini-screw implant

### Sheep

Two sheep with an age between 12-19 months old {passed the puberty age (5-8) months <sup>(9,10)</sup>} and weight near 50 kg were chosen for this study. Clinical examination by veterinarian for the temperature, heart rate, respiration rate, and activity revealed healthy sheep. The normal range of temperature is 38.9°C +/- 0.5°C, heart rate is 50-80 beats/minute (average 75 beats/min), respiration rate is 15-40 breaths/minute (at rest) <sup>(11,12)</sup>.

## Materials and Equipments

### Digital insertion screw driver (DID4)

The digital insertion screw driver (DID4) is a manual torque measuring screw driver designed to measure the insertion and removal torque of screws. It is manufacture by Cedar, Al-Berquque Industry, Michingan, USA. The range of measurements gives between 0.45 - 4.50 lb (Figure 2).



Figure 2: The digital insertion and removal torque screw driver.

Other materials and equipments used in this study were:

1. Portable engine (Marathon-3, Saeyang microtech, Daegu, Korea).
2. Hand-piece and micro-motors (Kazan medical instruments, Kazan, Russia).
3. Drugs and solution: Oxytetracycline base 200 mg., Xylazine base 20 mg per ml, Ketamine hydrochloride 50 mg/ml injection, Diclofenac sodium 75mg ampoule, Normal saline and Povidine Iodine.
4. Surgical instruments: scalpel, blade, artery forceps, curattes, syringes, mini-screw implants drilling burs
5. Accessories: cotton, sutures, surgical gloves, plaster, digital camera.

## Methods

At first all the materials and instruments were sterilized using autoclave and prepared over clean towel.

The sheep were anesthetized by Xylazine base (0.15mg for every 10Kg weight) and Ketamine

hydrochloride 500 mg; that are injected in the inner side of the lamp thigh. After about 5-10 minutes the sheep were underwent dizziness and then fall unconscious.

The skin over the tibia of the sheep was exposed by first shaving the wool (Figure 3). Using the surgical scalpel and blade No.11, the skin and periosteum was opened to expose the underlying bone (Figures 4). Then using heavy irrigation with normal saline and hand-piece with drilling speed set up to 2000 rmp, (as this will result in best osseointegration and produce less heat during drilling as reducing the heat generated during implant insertion may indeed decrease the devitalized zone next to an implant after surgical placement. <sup>(13)</sup>), drilling holes in bone using Dentos burs, which has a slightly smaller diameter than the screw diameter (1.2 mm bur for 1.4 mm MSI, as indicated in the instruction manual of the Dentos MSI), were made (Figure 5). The cortical bone width of the Tibia bone is ranged from 6.35-7mm in adult sheep. <sup>(14,15)</sup> The spaces between the holes of MSI were made 4 mm among them. This space will not affect the osseointegration process (minimum space between adjacent implants is 3mm) <sup>(16)</sup>.

Then the mini-screws were inserted into the bone using the digital insertion torque gauge screw driver trying to make the insertion torque universal for all screws (as the measuring of DID4 reached 16, stop the insertion process). The procedures were continued for ten mini-screws implants in each tibia (Figure 6). After inserting all screws, the area was irrigated, cleaned with gauze and the wound edges approximated and sutured using silk suture 3 zero, then the gauze was placed and bandaged with plaster.

After operation, antibiotic Oxytetracycline base 200 mg (1 ml for every 10 kg) one injection per 24 hour, and Diclofenac sodium 75 mg vial one vial every 24 hour immediately after operation for 3 days were given. The health of the sheep was monitored by the veterinarian. After 10 days, the bandage was removed and the wound were healed noticing that there was no sign of pus. The sutures were removed.

Ten of the forty inserted MSIs (immediate group) were removed immediately after insertion by DID4 (Figure 7) to assess the primary stability torque value. The primary stability depended on the pressure of the adjacent tissues against the screws when they were manually inserted. The other thirty MSIs were removed after 2 weeks, 4 weeks and 6 weeks respectively (ten MSIs for each time interval).



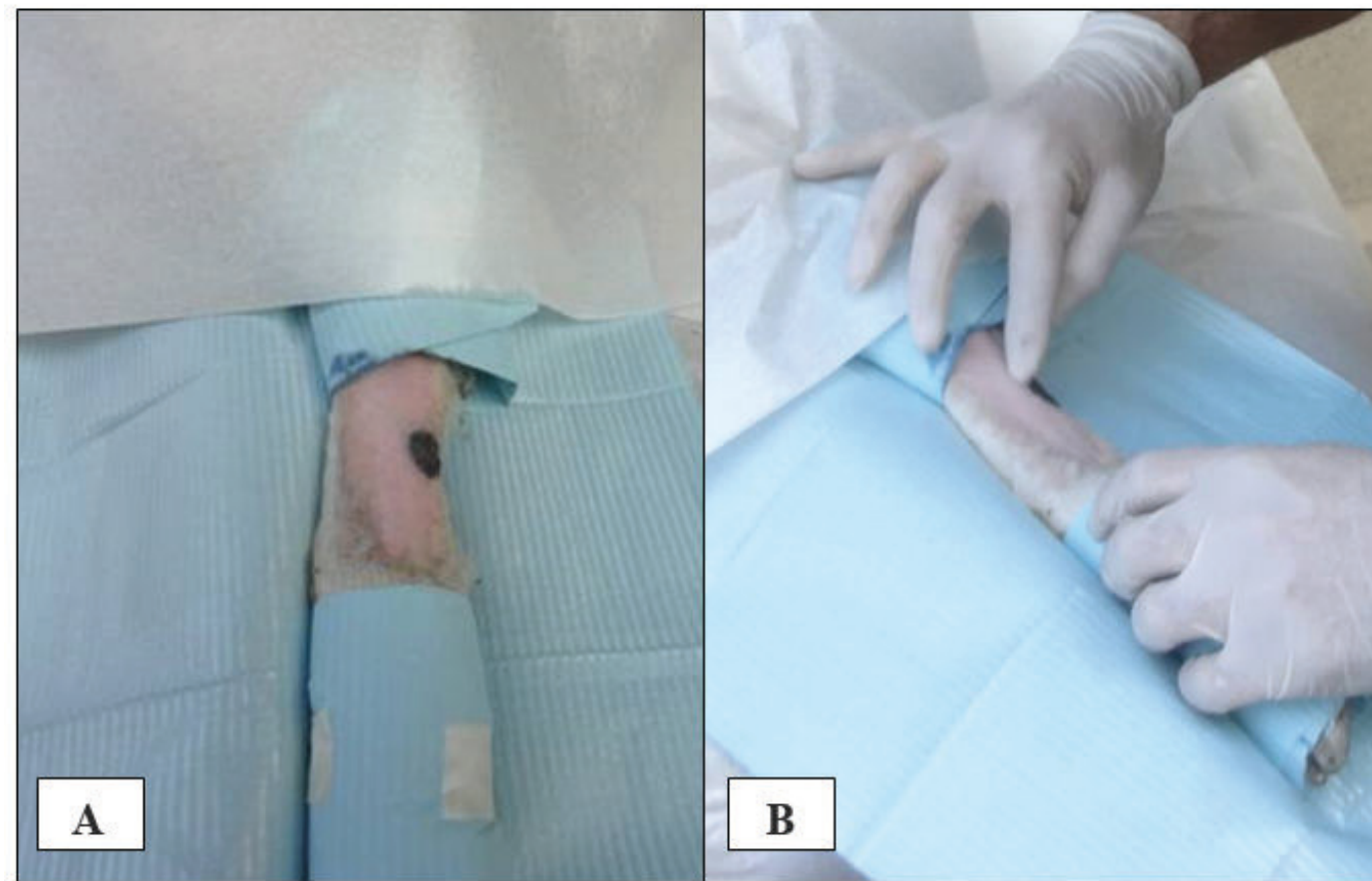


Figure 3: A. The exposed tibia after wool shaving. B. inspection of the tibia and vein position before using the blade

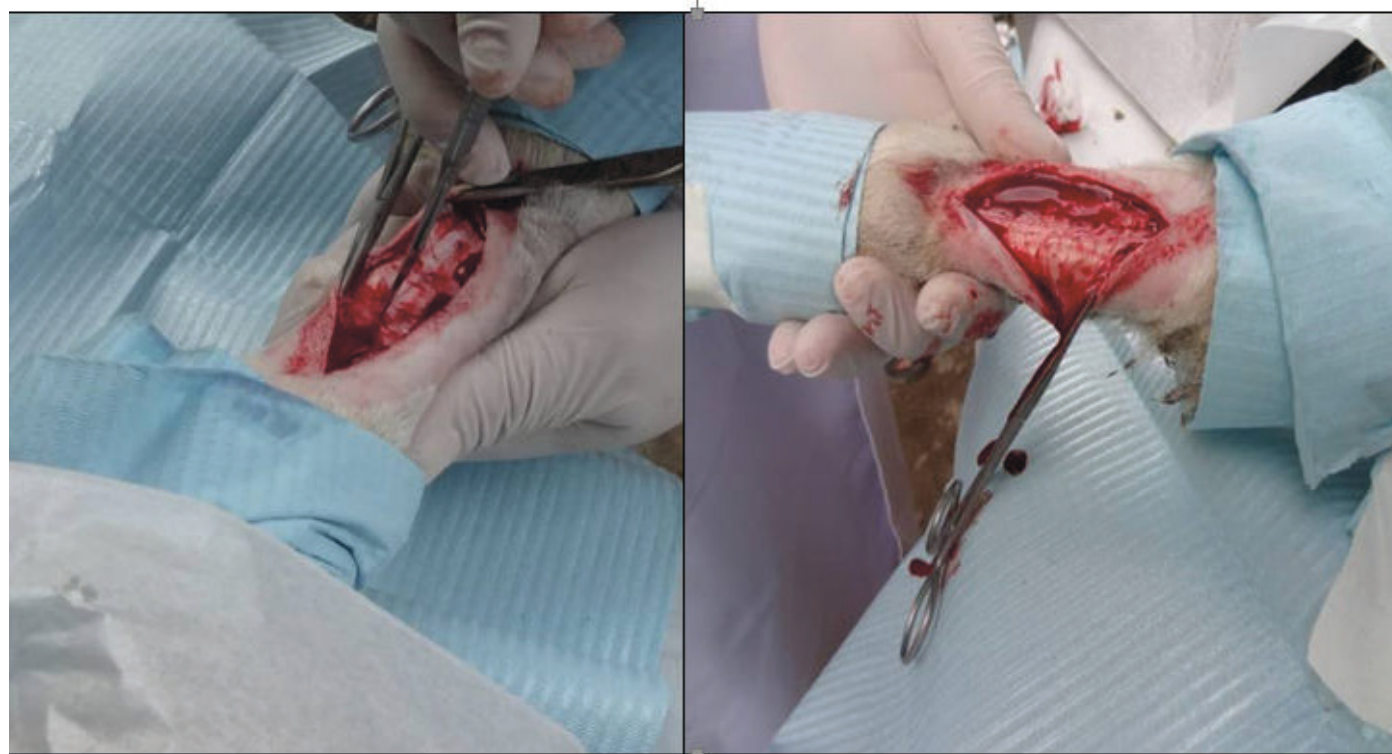


Figure 4: Incision to expose the underlying tibia bone.



Figure 5: The drilling of holes inside bone before MSI insertion.

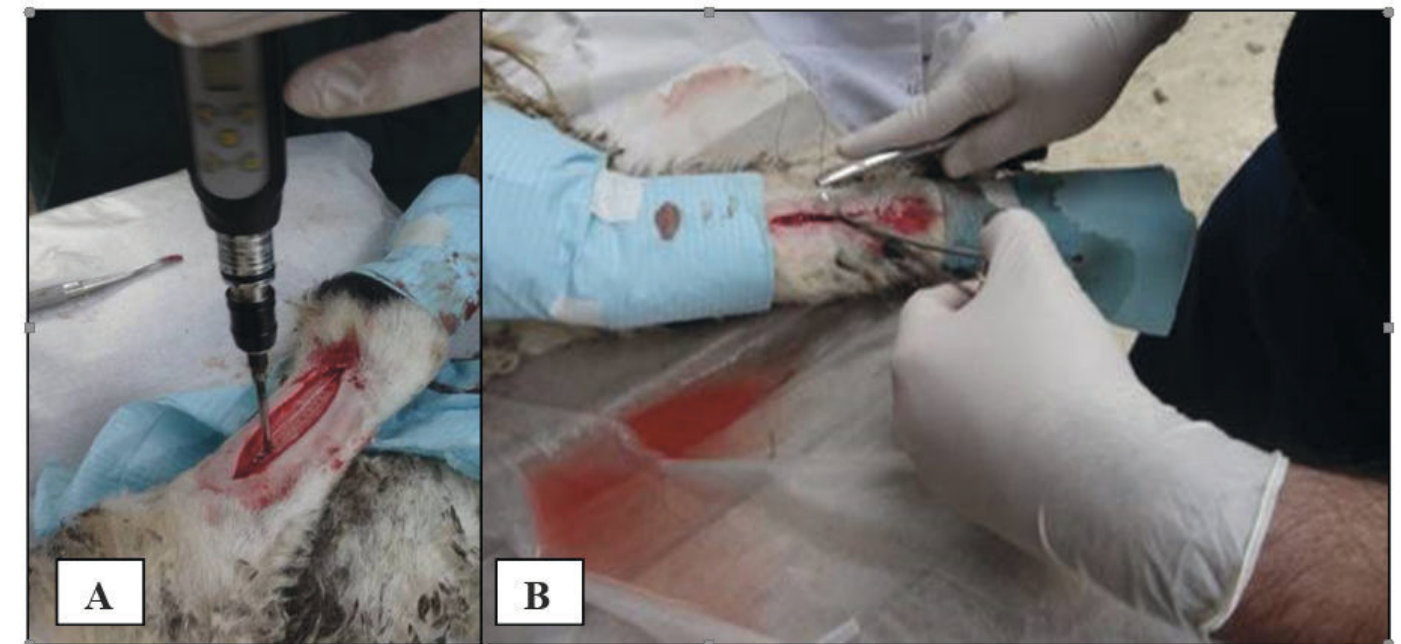


Figure 6: A-The insertion of MSI using digital insertion torque screw driver. B- Suturing of the wound.



Figure 7: The removal torque of the MSI.



Statistical analyses

The collected data were analyzed using SPSS version 19 (Statistical Package for Social Sciences). The statistical analyses included descriptive statistics (means, standard deviations, minimum and maximum values of removal torque). Inferential statistics included one-way ANOVA test to compare values of removal torque among different groups. LSD test was used to detect the difference between each two groups. Probability value (P-value) less than 0.05 was considered significant.

RESULTS

Table 1. Descriptive statistics and groups' differences in the value of torque removal (N/cm)

Periods	Descriptive statistics					Groups' differences		
	No.	Mean	S.D.	Min.	Max.	F-test	p-value	Sig.
Immediate	10	14.54	0.43	13.8	14.9	1513.036	0.000	HS
After 2 Weeks	10	13.72	0.26	13.4	14.1			
After 4 Weeks	10	30.36	0.63	29.7	31.2			
After 6 Weeks	10	33.84	0.89	32.8	35.1			

Table 2. LSD test after ANOVA

Groups		Mean Difference	p-value	Sig.
Immediate	After 2 Weeks	0.82	0.47	NS
	After 4 Weeks	-15.82	0.000	HS
	After 6 Weeks	-19.3	0.000	HS
After 2 Weeks	After 4 Weeks	-16.64	0.000	HS
	After 6 Weeks	-20.12	0.000	HS
After 4 Weeks	After 6 Weeks	-3.48	0.000	HS

HS: Highly significant; P-value ≤0.01

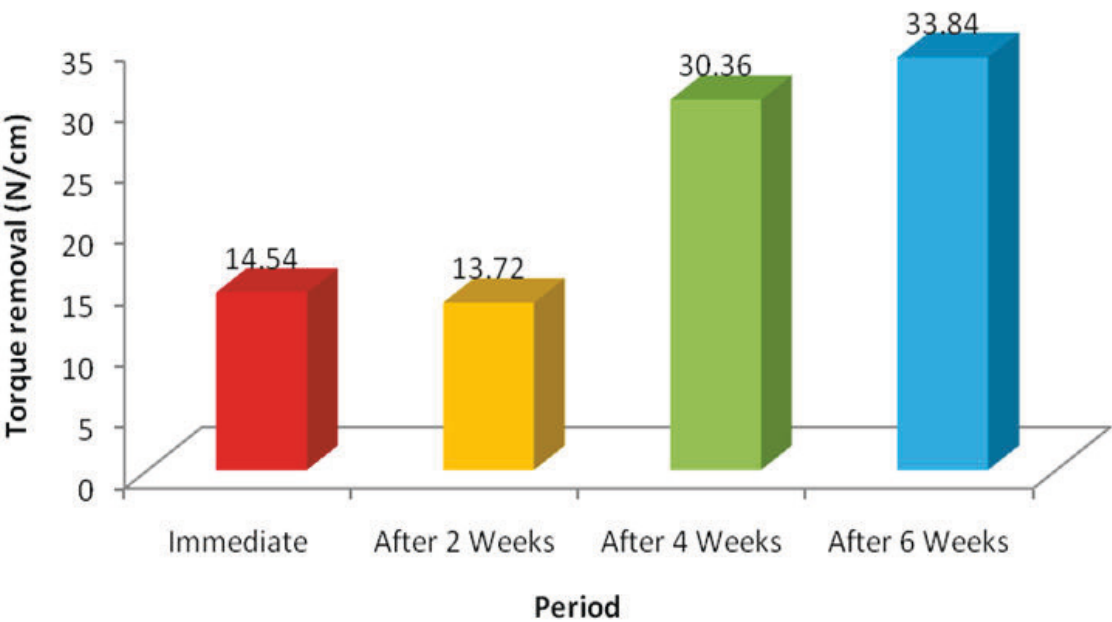


Figure 8: Bar chart showing the mean torque values of different period groups

Table 1 showed the descriptive statistics and groups' differences on the value of torque removal of the MSIs. The 6 weeks period group showed the greatest removal torque value then the 4 week period group followed by the immediate period group which was greater than the 2 weeks period group. ANOVA test showed statistically highly significant groups' difference.

LSD test showed a highly significant differences between each two groups except for the comparison between the immediate and 2 weeks group where there was non-significant difference.

DISCUSSION

The result showed that there was highly significant difference among all periods group with the highest one in the 6 week period group and the lowest in the 2 weeks period group. The primary stability (Immediate group) decreased immediately after MSI placement. López *et al.* reported a decrease in stability during the first two weeks after dental implant placement in the maxilla and mandible<sup>(17)</sup> while Barewal *et al.* reported decrease in stability from placement to week three in bone<sup>(18)</sup>.

The decrease in primary stability of MSIs during the first two weeks can be explained by the physiological processes occurring around the implant. Within two hours of implant placement, erythrocytes, neutrophils and macrophages coalesce in a fibrin network; osteoclasts and mesenchymal cells, which appeared by day four, begin removal of bone damaged during MSI placement. This leads to the decrease in stability and torque value and holds important implications for the management of MSIs<sup>(19)</sup>.

Removal torque value begins to increase in the 4 weeks and 6 weeks period groups, which was associated with healing and increases in total MSI stability. Derid *et al.* stated that the secondary stability first becomes evident three weeks after mini-screw placement. The results indicated that secondary stability continues to increase through the fifth week and then appears to level off.<sup>(20)</sup> López *et al.* also described an increase of stability for dental implants after fourth week of placement<sup>(17)</sup>.

CONCLUSIONS

All MSIs showed less removal torque than insertion in immediate removal period group. After two weeks, the removal torque values MSIs showed decrease in stability comparing to immediate period group, then increase in the 4 weeks and 6 weeks, so the best stability shown in the 6 weeks healing period group, while the least stability shown in the 2 weeks healing period group.

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The Effect of Addition of Titanium Oxide Nanofillers on The Water Sorption and Solubility of Resin Based Composite (An In Vitro Study)

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ABSTRACT

**Background and Objectives:** The aim of this study was to measure the water sorption (Wsp) and water solubility (Wsl) of modified microhybrid composite resins by adding Titanium oxide nanofillers in four concentration 0.5% , 1%, 3% and 5% and comparing them to unmodified microhybrid composite resins and to nanofilled composite resin.

**Methods:** For water sorption (Wsp) and solubility (Wsl), ten disk-shaped specimens of each resin composite were made for each group and stored in desiccators until constant mass was achieved. Specimens were then stored in water for 7 days, and the mass of each specimen was measured. The specimens were dried again and weighed. The Wsp and Wsl were calculated from these measurements. Data analyzed by one-way ANOVA.

**Results:** The results showed there were significant differences among the groups in the Wsp mean values which ranged from 20.2120 to 28.4680 µg/ mm³, while the Wsl mean values were ranged from 1.1060 to 5.6800 µg/ mm³.

**Conclusion:** The addition of TiO2 nanofillers to microhybrid composite increased the Wsp and Wsl values compared to the control group but still lower than the value established by the ISO 4049 standard.

**KEY WORDS:** Resin composite, Sorption, Solubility, solubility

INTRODUCTION

The current trend in modern resin based composites (RBCs) of minimizing filler size whilst aiming to improve the filler loading has sought to optimize the resultant mechano-physical properties and clinical performance. The introduction of so-called ‘nanofilled’ and ‘nano-hybrid’ materials therefore appears a logical continuation of this trend (1, 2).

Water sorption by composite materials is a diffusion-controlled process, and the water uptake occurs largely in the resin matrix. The water sorbed by the polymer matrix could cause filler – matrix debonding or even hydrolytic degradation of the fillers, and may affect composite materials by reducing their mechanical properties (3, 4).

As candidate inorganic filler, TiO2 has many excellent properties: it is nontoxic while chemically stable, and exhibits a highly efficient photocatalytic effect. Researchers have used TiO2 nanoparticles as filler in epoxy, finding that their presence can overcome the drawbacks of traditional tougheners such as glass and rubber beads by improving the

stiffness, strength and toughness of the epoxy without sacrificing its thermo-mechanical properties (5,6)

Z 250 is a microhybrid composite resin commonly used for restoration of the teeth. This study was designed to evaluate the water sorption and water solubility of previously mentioned composite after the addition of nano-sized fillers of titanium oxide in four different concentrations.

MATERIALS AND METHODS

Materials

Two commercial composite resins {Microhybrid composite (MH) Z 250 (as control group), Nanofilled composite resin Filtek Z350 XT (as reference group)} were used in this study. Different concentration of silane coated titanium oxide nanofillers were added to the MH composite. The commercial name, composition and manufacturer of the materials used in this study are listed in Table (1).

LED (Bluephase C5, Ivoclar Vivadent] at 400 m W/ cm² was used in this study.

Table (1) The commercial name, the composition and manufacturer of the materials used:

Materials	Composition	Manufacturer
Filtek Z350 XT	Bis-GMA, UDMA, TEGDMA,, Bis-EMA Fillers (78.5%W, 59.5% V): Combination of non-agglomerated/ non- aggregated 20 nm silica filler, non- agglomerated/ non- aggregated 4-11 nm zirconia filler, Aggregated zirconia/silica cluster filler.	3M ESPE, St Paul, MN, USA
Filtek Z250	Matrix: Bis-GMA, UDMA, and Bis-EMA. Filler: zirconia/silica (0.01-3.5 µm). Filler by volume: 60% Filler by weight: 82%	3M ESPE, St Paul, MN, USA

Methods:

Preparation of the composite resin specimens

A universal microhybrid commercial composite resin (Fitek Z250) was used as control material and blended with the inorganic nanoparticles. A commercial universal nanofilled composite was used as a reference to compare with the nanoparticle-blended experimental composites (7, 8).

Addition of Titanium oxide nanoparticles

The silane coated titanium oxide nanoparticles were manually added to microhybrid RBCs, at four different weight ratios: 0.5 % , 1%, 3% and

5% depending on the sample group. The mixture thoroughly blended by speed mixture device. The resulting paste packed into teflon molds using an oscillator to remove pores, and covered on both sides with a clear glass plate (7, 8, 9).

Groups design:

Six groups of samples denoted C, F, T1, T2, T3 and T4 were defined. The nanoparticle type and weight ratio characterizing of each group are shown in (Figure 1), Each of these groups was subjected Water sorption WS and solubility SO.

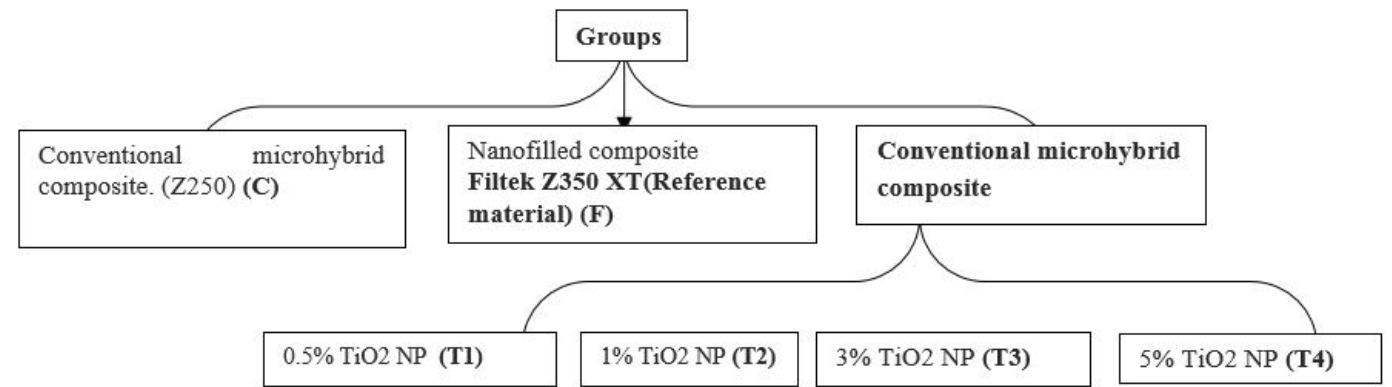


Figure (1): Diagrammatic illustration of experimental design of groups for the study

Evaluation of Water sorption and solubility

Ten mould discs 15±1mm in diameter and 0.5±0.1mm thick were prepared for each group. The moulds slightly over filled with the material, prepared in accordance with the manufacturer’s instructions. Then the exit window of the external energy source placed against the quartz glass plate. The exit window was moved and irradiates a section of the specimen overlapping the previous section of the specimen; the recommended exposure time should be followed in this procedure (10). The cured specimens were removed from the mould and transferred to the desiccators maintain at (37 + 1)°C. After 24 hr the specimens were removed, then stored them in a desiccators maintained at (23± 1°C) for 1 h and then weigh them to an accuracy of ± 0.2 mg. This cycle was repeated until the mass loss of each specimen is not more than

0.2 mg in any 24 h period (m). Then the specimens would be immersed in water and maintain at (37 ±1) °C for 7 days and this mass record as (m2). After this weighing, recondition the specimens to constant mass in the desiccators, the recorded constant mass is (m3). The diameter and the thickness of the specimen would be measured at the center of the specimen and four points on the circumference; calculate the volume, V, in cubic millimeters (10). The values for WS in micrograms per cubic millimeter was calculated using the following equation:

Wsp = M2-M3/V

To calculate the values for water solubility (SO) in micrograms per cubic millimeter the following equation was used:

Wsl = m – m3/V



RESULT

Water sorption (Wsp) mean values are presented in Table 2. and Figure 2. ANOVA revealed significant differences among the groups (p<0.05). Control and T1 groups showed the significantly lowest Wsp

values without significant difference between them, followed by T2 group, then Reference and T3 groups without statistical difference between them. While T4 were the group with the highest water sorption values.

Table 2: Mean values (µg/mm³), standard deviations, standard errors and 95% confidence intervals for water sorption (Wsp) data.

Groups	N	Mean	SD	SE	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Control	10	20.2120 a	1.0077	0.3186	19.49111	20.93289
Reference	10	25.3550 c	1.6876	0.5336	24.14774	26.56226
T1	10	20.7360 a	0.9257	0.2927	20.07375	21.39825
T2	10	21.8270 b	1.1188	0.3538	21.02662	22.62738
T3	10	26.1250 c	1.3029	0.4120	25.19293	27.05707
T4	10	28.4680 d	0.9422	0.2979	27.79396	29.14204

Different alphabets show significant differences.

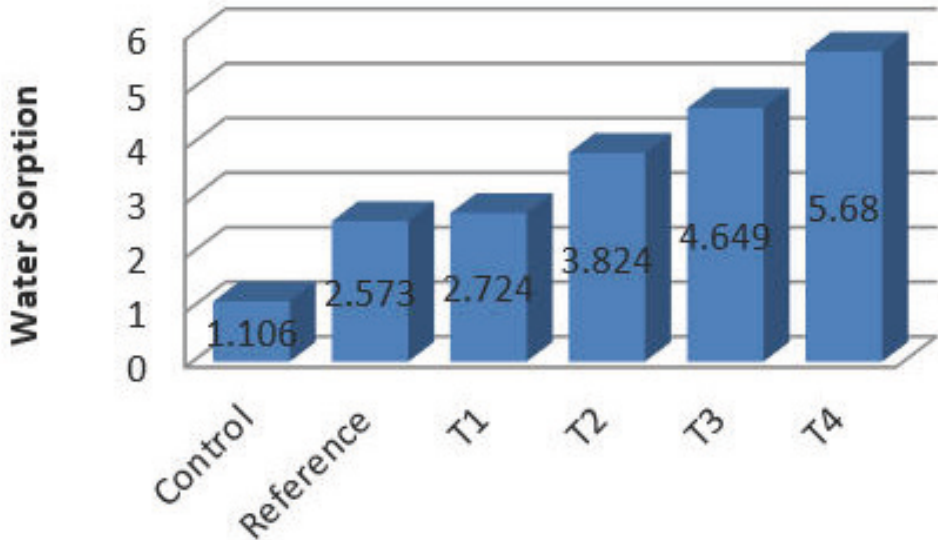


Figure 2: Bar chart for the means of Water sorption of the tested groups.

Water solubility (Wsl) mean values are presented in Table 3 and Figure 3. ANOVA revealed significant differences among the groups (p<0.05). Control group showed the significantly lowest Wsl values, followed by Reference and T1 groups without statistical difference between them, followed by T2 and T3 groups with statistical difference between them. While T4 group were the group with the highest water solubility values.

Table 3: Mean values (µg/mm³), standard deviations, standard errors and 95% confidence intervals for water solubility (Wsl) data.

Groups	No.	Means	SD	SE	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Control	10	1.10600 a	0.138339	0.043747	1.00704	1.20496
Reference	10	2.57300 b	0.356621	0.112774	2.31789	2.82811
T1	10	2.72400 b	0.583480	0.184513	2.30660	3.14140
T2	10	3.82400 c	0.747428	0.236358	3.28932	4.35868
T3	10	4.64900 d	1.068753	0.337969	3.88446	5.41354
T4	10	5.68000 e	0.772025	0.244136	5.12773	6.23227

Different alphabets show significant differences.

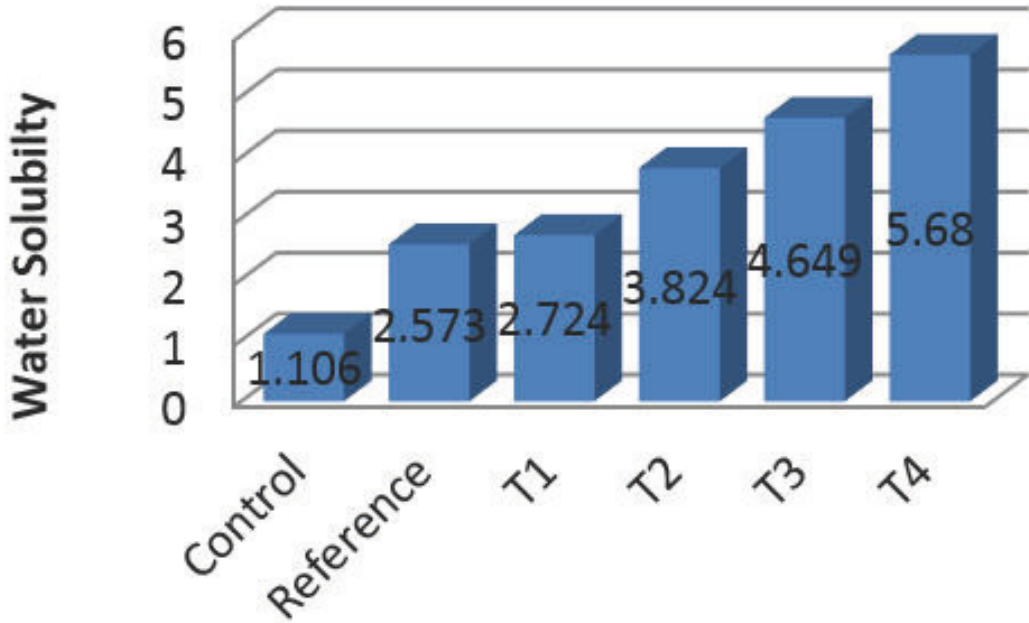


Figure 3: Bar chart for the means of Water solubility of the tested groups.

DISCUSSION

According to ISO standard 4049-2009, the maximum acceptable and critical values of sorption (Wsp) and solubility (Wsl) for polymer-based restorative materials are 40 µg/mm³ and 7.5 µg/mm³ respectively. Water sorption and solubility values above these critical points have an adverse effect on the physical and mechanical properties of these materials, such as strength, surface hardness, wear resistance, and color stability, and thus on their clinical behavior and biocompatibility (11,12).

Several factors, such as the chemical composition and hydrophilicity of the organic matrix, filler particle type, size and content, depth of cure, storage time, type and PH of storage solution strongly affect the Wsp and leachability behavior of the material (13, 14, 15).

The result of present study showed that the control group had significantly lowest Wsp value (20.2120 µg/mm³). The result in the difference in Wsp value for the two types of resin composite uses in this study could be attributed to the fact the difference in the resin matrix may influence on the values for the Wsp of the tested samples. The two commercial composites resin (Filtek Z350XT and Filtek Z250) contain BisGMA, other constituent such as di- and methacrylate monomers (Bis-EMA, TEGDMA and UDMA) are also present in Filtek Z350XT, and this difference in the resin matrix may influence on the values for the Wsp of the tested samples.

The high viscosity of the polymer requires the addition of diluents monomers, such as TEG-DMA. Such diluents monomers, coupled with the presence

of hydroxyl groups in the Bis-GMA molecule, result in an increase in Wsp of Filtek Z350 (16,17). Urethane dimethacrylate (UDMA) is also more hydrophilic than the Bisphenol-A system. In addition Filtek Z350XT contains silica nanofiller that consist from both non-aggregated particles and agglomerated ones (nanoclusters). It assumed that the porous nature of silica nanoclusters were inadequately infiltrated by the resin matrix , they provides a large surface area allowing fluids to accumulate around the filler-polymer interface and leading to a higher water sorption. This all reasons that could explain the results in this study for water sorption in which nanofilled showed higher Wsp value compared to microhybrid composite This finding is in agreement with the study of Toledano *et al.* (2003)(15) who showed that the nanofilled composite showed higher Wsp value than microhybrid composite.

The present study showed that the addition of TiO2 nanofillers in 0.5% to the microhybrid composite statistically had no significant effect on Wsp value compared to control group, while the addition of TiO2 nanofillers in 1%, 3% and 5% to the microhybrid composite statistically had significant effect on Wsp value compared to control group, this could be due to the fact that addition of filler may contribute to agglomeration of nanofillers which assumed to be the reason for the high water uptake. The findings of the present study are in agreement with a study by Ilie and Hickel (2009)(16) and of Garoushi *et al.* (2011) (17) who found that the group with higher fraction of added nanometer sized fillers showed highest water

uptake.

Regarding the water solubility, the mean solubility values presented by the tested resin composites varied from 1.106 to 5.680  $\mu\text{g}/\text{mm}^3$  (these values were lower than the maximum value established by the ISO 4049 standard ( $<7.5 \mu\text{g}/\text{mm}^3$ ). This range is in agreement with the findings of a previous study of Toledano *et al.* (2003)<sup>(15)</sup>.

Filtek Z 350 XT presented a significantly higher solubility than the microhybrid one. This result may be attributed to the differences in the filler particle systems of the two resin composites. The filler particles of nanofilled composite will theoretically present a greater total surface area, due to nonagglomerated 20 nm silica filler. Two factors derived from this fact can increase the solubility. Firstly, a great amount of ions will be released from the surfaces of filler particles. Secondly, coupling agents associated with the filler particles are prone to hydrolysis via ester linkages within the molecules or siloxane links that are formed with the filler particles. Water in contact with silica filler surfaces breaks siloxane bonds to form silanol groups and facilitate particles debonding. Based on this, it is reasonable to speculate that more filler particles were eluted from the nanofilled composite, thus increasing its solubility. This finding is in agreement with Hofmann, *et al.* (18).

The present study showed that the addition of TiO<sub>2</sub> nanofillers to the microhybrid composite statistically had a significant effect on Wsl value compared to control group due to hydrophilic nature of silane coated the nanofillers and absorb more amount of water. Most probable site for accommodation of additional water is the interface between the inorganic filler particle and the polymer matrix, break the bonds and the hydrolysis induces debonding of the filler particles (19).

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## The Quality of Root Canal Preparation in Canals Treated with Rotary versus Self-adjusting Files: A Three-Dimensional Micro-Computed Tomography Study

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## ABSTRACT

**Background and Objectives:** The study was designed to quantitatively evaluate the quality of root canal preparation in canals treated with either rotary (ProTaper Next) or self adjusting files (SAF), using high resolution three-dimensional micro-computed tomographic (Micro-CT) analysis

**Methods:** twenty extracted single canal tooth were selected, the root canal divided in 2 groups. In the first group, the root canal instrumented by using ProTaper Next rotary system and the root canal irrigated with 4ml of NaOCl after each instrument. The root canals in the second group were prepared using SAF for 2min, with continuous irrigation (NaOCl), after rescanning, the area of the canal wall unaffected by the preparation procedure was analyzed using before and after micro-CT images.

**Result:** A high percentage of unaffected root canal walls were found in canals treated with rotary files, with no significant difference between two groups.

**Conclusion:** Within the limitations of the present study, the self-adjusting files allowed better cleaning and shaping of the root canal filling than those allowed by rotary files.

**Keywords:** ProTaper Next, Self adjusting file, Micro-CT, Unaffected root canals.

## INTRODUCTION

The chemiomechanical root canal preparation is an essential step of root canal treatment aimed to making the root canal system ready for the subsequent procedure (1,2). however, to obtain adequate root canal disinfection may be compromised by anatomic complexity (3). The new technology for mechanical root canal preparation which include using nickel titanium rotary file systems has failed in debriding flat or oval shaped canals, leaving a substantial amount of untreated dentin areas. This untreated dentin may harbor unaffected residual bacterial biofilms and serve as a potential cause of persistent infection and poor treatment outcome (4, 5).

In an attempt to overcome the limitation of current instrument technique, a new instrument; the self-adjusting file (SAF) has been developed. It is a flexible hallow instrument, designed to adapt three dimensionally to the root canal cross section with continuous irrigation through the instrumentation procedure. The surface of the file is lightly abrasive like sandpapers to scrap the dentin uniformly and enlarge the canal according to the cross section without change (6, 7).

While the Protaper Next file considered as a new file that are M- wire used in construction of it and the taperness changed this may lead to more surface area touched and prepared specially in flat and oval-shaped canal. Hence, the present study was designed to quantitatively evaluate the amount of touched

surface and prepared canal surface (8).

The present study was designed to compare two instrumentation methods (SAF system and ProTaper Next system) using three dimensional micro computed tomography. The quality of root canal cleaning and shaping expressed by root canal wall area affected/unaffected during the instrumentation.

## METHOD

### Selection of teeth:

The extracted teeth were collected for the reasons unrelated to the current study and kept in 10% buffered formalin solution. Two dimensional cross-sections and three dimensional images obtained using micro computed tomography for each tooth in this collection.

Then twenty roots were selected based on matching root canal morphology, based on similarity in size, flatness, and curvature of the root canals and then randomly divided into two groups (group treated with rotary file and group treated with SAF).

### Root canal cleaning and shaping.

#### Rotary file: Group -1-

The rotary file (ProTaper Next) were operated with handpiece attached to a speed and torque controlled motor (X-Smart, Dentsply – Maillefer) at 300 rpm. The sequence used was ProTaper Next X1 and X2 with Rc-Prep as a chelator/lubricant with each instrument. The canal was irrigated with



4ml 3% sodium hypochlorite (NaOCl) between the instruments. Final flush was applied with 5ml 17% EDTA followed by 5ml 3% NaOCl to remove EDTA and the canal was dried using paper points.

SAF: Group -2-

The SAF was operated for 2 minute using a Gentle powerLux 20LP Kavohandpiece, adapted with RDT3 head (ReDent-Nova, Israel). The rotation speed was set at 5000 rpm. the instrument was used with in and out motion to full working length with continuous irrigation throughout the procedures (VATEA irrigation device) during the instrumentation 3% NaOCl was used. A final flush with 5ml 17% EDTA was applied followed by 5ml 3% NaOCl to remove the EDTA then the canal was dried using paper points.

Micro-CT evaluation:

Before root canal instrumentation and scanning, each experimental tooth was mounted on custom made holding fixture to ensure precise repositioning of the specimens into the scanning system. An adhesive radiopaque grid was attached to the holding fixture to be used as a reference guide for comparing the pre and post instrumentation scans (all the samples fixed in the micro-CT by holding fixture for standardization)

The tooth were scanned before and after canal preparation with a commercially available micro-CT (Brüttisellen, Switzerland), teeth were scanned at 70 kVp, Intensity 114 µA, the chosen voxel size was 40µm in all three spatial dimensions. For each sample, 800 to 1000 slices were scanned, covering a total of 14 mm.

The mounting device ensured almost exact repositioning of the samples for both pre and post

scanning procedure. Superimposition was calculated subsequently with the software package IPL V5.15. The two three dimensional scans were co registered with each other by three dimensional rotation and translation determined by maximizing the cross-correlation of the two overlaid three –dimensional datasets of the outer hull of the tooth, which is unchanged by the root canal treatment. Then by varying the relative translation in all three directions, we automatically detected the best superimposition of the outer root contour, with a precision better than one voxel. Superimposition of the root canal before and after instrumentation enables visualization and quantitatively three-dimensional evaluation of the amount of unaffected and affected area. This parameter was expressed as a percentage of the static surface voxel of the total number of the surface voxel.

RESULTS

Matched images of the surface area voxels of the canals, before and after preparation, were examined to evaluate the amount of affected and unaffected surface; the root canal surface unaffected by root canal instrumentation was measured as a voxels percentage of the root canal surface area before and after instrumentation and had been shown in the (Figure 1). The (Figure 2 and 3) showed the area affected/unaffected by instrumentation with ProTaper Next and SAF respectively. The mean unaffected area was 21.104% and 26.49% for SAF and rotary file groups respectively. By using t-independent test, there was non-significant difference between the two groups (Table. 1) with in favor of SAF system over ProTaper Next system at P<0.05.

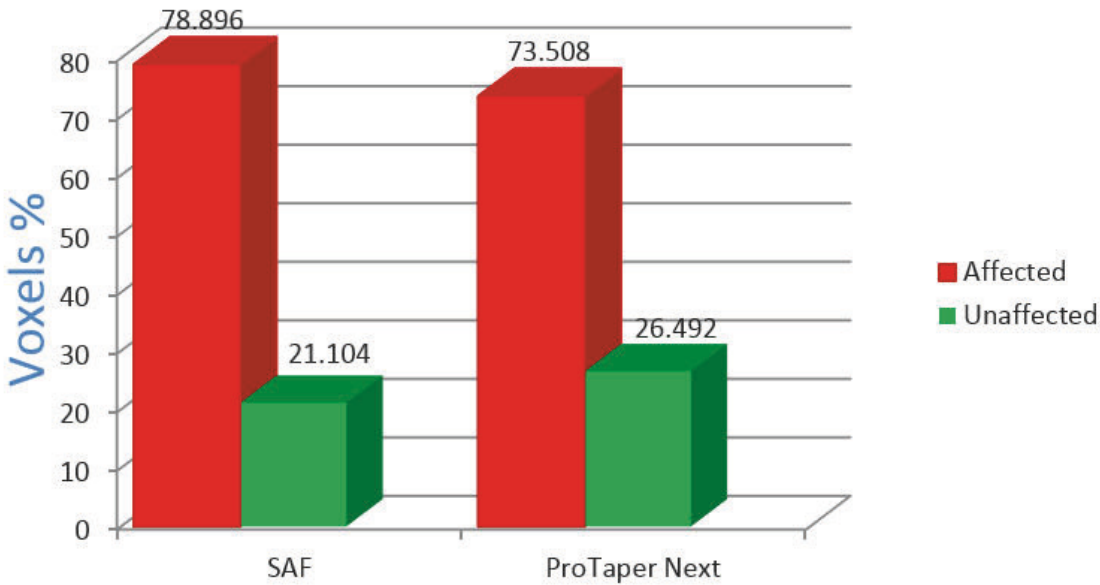


Figure 1: Bar chart representing difference between the two instruments for the percentage of the affected/un-affected canal wall

Table 1: t-test for the difference between the two instruments used for preparation of the root canal samples in the percentage of the unaffected canal

Independent Samples Test								
Instruments	Mean difference	Std. Deviation difference	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
ProTaper Next- SAF	5.388500	2.0035291	3.452	1.1792415	9.5977585	2.690	18	.059

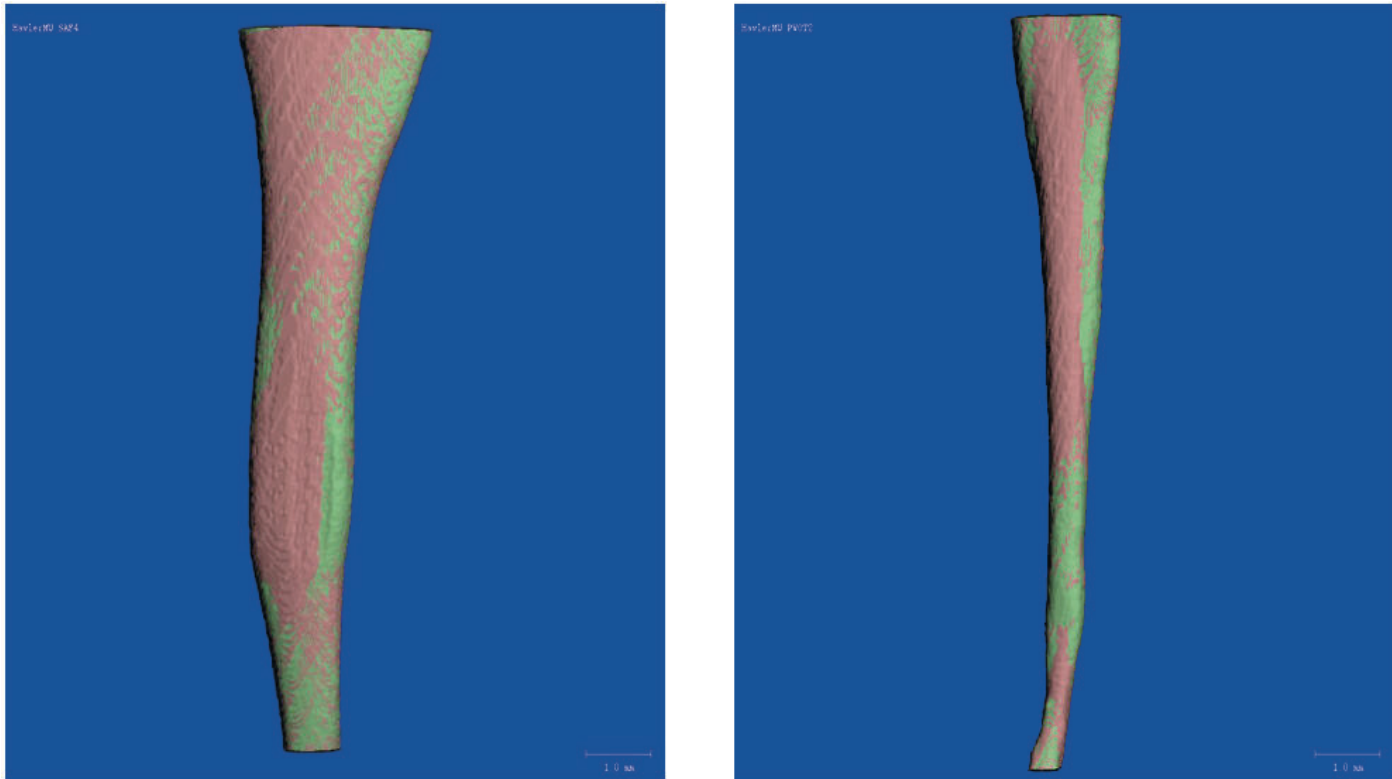


Figure 2: Photographs of canal prepared by ProTaper Next System showed the affected surface red in color and the unaffected surface green in color.

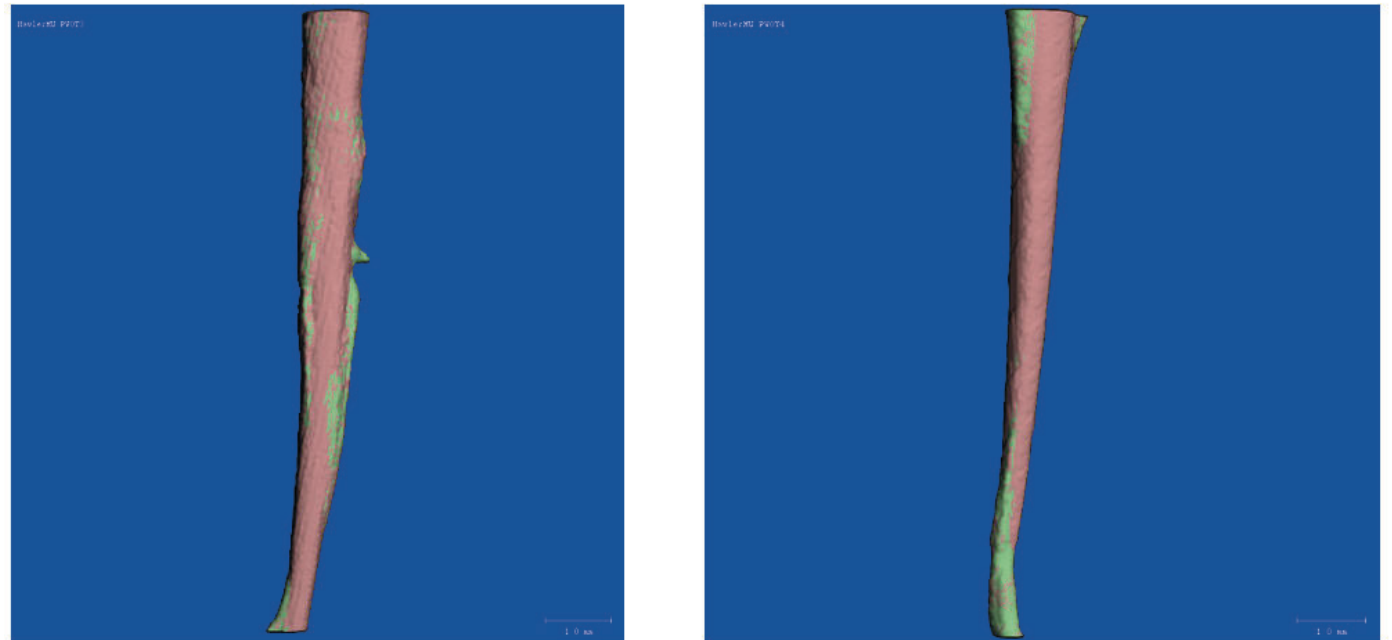


Figure 3: Photographs of canal prepared by SAF System showed the affected surface red in color and the unaffected surface green in color.

## DISCUSSION

The self-adjusting file were recently introduced and they employ many new design features, such as flexible, compressible, adapted three dimensionally to the canal, continuous irrigation and vibration instead of rotation. This concept is felt to allow efficient canal preparation without changing the canal configuration than previous system did and by the previously mentioned features the file having the ability to reach all the area of the canal and affecting all the surface of the root canal. Many authors have evaluated the shaping ability of SAF instrument using simulated canals and extracted teeth <sup>(9-11)</sup>.

Micro computed tomography was used in this study because micro-CT is emerge in several endodontic research facilities as a nondestructive, repeatable and accurate method to analyze canal geometry and quality cleaning and shaping as expressed by voxel percentage of root canal surface affected and unaffected by instruments <sup>(12)</sup>.

In this study, comparing the SAF with ProTaper Next system because both systems considered as a relatively new system which are commercially available in the market. The present study clearly showed that there was no significant difference between two groups. This may be due to the intimate contact of the SAF instrument to the canal during the procedure for 2 minute without interruption and the scrubbing motion of the file with continuous irrigation helps the file to touch more the canal walls in addition to the flexibility and compressibility feature of the file that tend to reach all the surface areas of the canal such as curvatures and fins. On the other hand the ProTaper Next having the same feature of ProTaper except the M- wire used in construction of it and the taperness changed this may lead to more surface area touched and prepared specially in flat and oval-shaped canal. In addition to that more than one file used during the procedure this may increase the affected surface.

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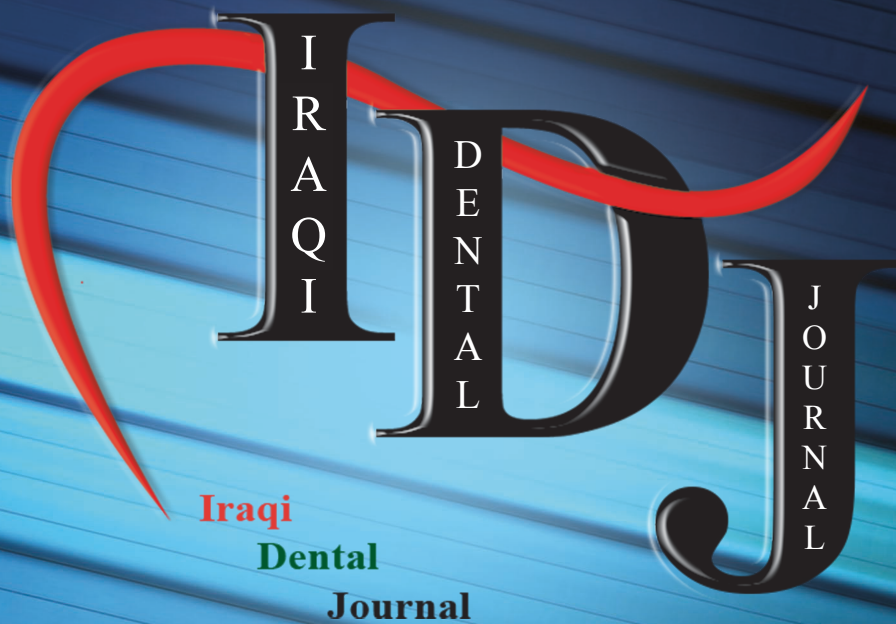
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