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Ministry of Higher Education and scientific Research
Ibn Sina University of Medical and Pharmaceutical Sciences
College of Dentistry

# Preference of different anterior composite materials among Iraqi specialist dentists

A graduation project submitted to the clinical sciences Department – College of Dentistry, Ibn Sina University of Medical and Pharmaceutical as partial fulfilment of requirement for the degree of Bachelor in Dentistry

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بِسم اللّه الرَحمنْ الرَحيمْ

(يَرْفَعِ اللَّهُ الَّذِينَ آمَنُوا مِنكُمْ وَالَّذِينَ أُوتُوا الْعِلْمَ دَرَجَاتٍ)

صَدقَ اللهُ العَظيمْ

المجُادلة ١١

## Supervisor certification

I certify that the organization and preparation of this project entitled (preference of different anterior composite materials among Iraqi specialist dentist) have been made by the undergraduate students: (Mohammed Wissam Abdull Aziz, Mina Omar Ali, Saba Jalil Nawaf) under my supervision at Clinical Sciences Department - College of Dentistry - Ibn Sina University for Medical and Pharmaceutical Sciences as partial fulfillment of requirements of the bachelor degree.

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Superviso

**Abstract**

**Background:** In recent years, there has been a notable shift in restorative dental procedures, understanding the preferences of dental professionals regarding anterior composite materials is vital for enhancing clinical outcomes and patient satisfaction. By gaining insights into the factors that influence material selection, the findings of this research can help optimize the choice of anterior composites in the Iraqi dental community.

**Aim of the study:** The primary aim of this research is to explore the preference of different anterior composite materials among Iraqi specialist dentists.

**Subject and methods:** A cross sectional descriptive study based on online questionnaire for about 103 dentists for both genders (58 males, 45 females) participated in the research.

**Results:** The majority of dentists preferred properties such as handling, adaptations, and shade matching (64.1%), as well as polishability (48.5%) and strength (40.8%) when choosing the anterior composite materials.

**Conclusion:** Tokuyama PALFIQUE LX5, with a selection rate of 24.3% was the composite of choice among Iraqi dentists we surveyed with the layering technique of application as the best-chosen technique.

# Dedication

This study is wholeheartedly dedicated to our beloved parents, who have been our source of inspiration and gave us strength when we thought of giving up, who continually provide their moral, spiritual, emotional, and financial support. Everything I am, or ever will be, I owe it to my mother and this is just the beginning. To my biggest supporter, who keeps saying "I am proud of you" in my failures before my successes, to my father. To our brothers, sisters, relatives, mentor, friends, and classmates who shared their words of advice and encouragement to finish this study.

**Mohammed Wissaam Abdull Aziz**
**Mina Omar Ali**
**Saba Jalil Nawaf**

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Finally, we would like to acknowledge the contributions of my family, friends, colleagues, and loved ones who have supported us throughout this journey. Your encouragement, prayers, and motivation have been instrumental in my success.

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# 1- Introduction

## 1.1 Introduction

The era of dental composites began about 1954 when silicate cements and unfilled methyl methacrylate resins were the only esthetic direct filling materials. Dental composites have come a long way over the last five decades with continuous improvements to become the material of choice for most anterior and posterior restorations. Composites resins have become the first choice for direct anterior and posterior restorations.The term "composite material" refers to a material made up of at least two distinct components, insoluble in each other, which produce a material with different, often better, characteristics than the components alone. (V. Miletic, 2018).

The great popularity is related to their esthetic appearance and reduced need of sound tissue removal as compared with former treatments. Several studies have demonstrated that composite restorations may last long in clinical service. (Demarco FF ,2017).

For more than 40 years dentists worldwide have been using directly placed resin-bonded composite to restore damaged anterior teeth. While such techniques are invariably more conservative of tooth tissue than indirect procedures, operative techniques using direct composite can be challenging and are considered technique sensitive. Clinicians require both technical and artistic skill to provide composite restorations that restore function and aesthetics to blend seamlessly with the residual dentition. A myriad of composite brands in the market which differ from each other in the mechanical properties, shade variations, manipulation and cost. this has rendered it a challenging task to the dentist to choose a satisfactory brand. (V. Miletic, 2018).

## 1.2 The aim of the study:

With more choices of dental composite brands available in the Iraqi market than ever before, our study was conducted among Iraqi dentists to determine

1- Preference of composite brands used in the anterior teeth restoration.
2- The important factors that dentists consider when choosing a brand.

## 1.3 Literature Review

### 1.3.1 History of anterior fillings

Ever since the introduction of light-curable resin- based composites in the 1970s, these mixtures of organic and inorganic phases have continuously evolved to meet the increasing requirements of material design and dental practitioners.

During the past 60 years, the use of composite resin for direct restorations in anterior and posterior teeth has increased significantly, largely due to the esthetic demands of patients and concerns regarding mercury in amalgam fillings. Because composite resins require little to no preparation, minimally invasive procedures can be used to preserve tooth structure and provide natural-looking results (Frank J. Milnar, 2011).

The first acrylic resin replacement was introduced: composites. At this time, polymerization through electromagnetic radiation appeared to solve historical mixing problems.However, particles were too large, only four shades were available, and resins were difficult to polish. In addition, acid-etch techniques often damaged tooth structure, leading to aggressive endodontic therapy. Newer composite filling materials provided esthetic Results; however, incremental layering and the effects of shrinkage were not well understood. (Cabanes-Vila JC. et al,. 2006).

### 1.3.2 Composition of composite restoration

#### 1.3.2.1 Resin matrix

The most commonly used monomeric matrices in composite resin distribution today are 2,2-bis[4(2-hydroxy-3- methacryloxy-propyloxy)-phenyl] propane (Bis-GMA) and urethane dimethacrylate (UDMA). Both monomers have reactive carbon double bond at each end of monomer chain which will increase during polymerization. Monomer has high viscosity, especially Bis-GMA, so dilunets should be added to get clinical consistency after the filler is added. Compound which has low molecular weight with difunctional carbon double bond is used to reduce and control the viscosity of composite resin mix, e.g. triethylene glycol dimethacrylate (TEGDMA), or Bis-EMA6 (Craig, 2006).

#### 1.3.2.2 Fillers

Various transparent mineral fillers are used to reinforce composite resin and reduce the shrinkage in the curing process and thermal expansion (generally, filler composition is between 30% to 70% of the volume or 50% to 85% of the composite weight). It includes "soft glass" and "hard glass" of borosilicate, fused quartz, aluminum silicate, lithium aluminum silicate (beta-eucryptite, which has negative thermal expansion coefficient), ytterbium fluoride, and barium (Ba), strontium (Sr), zirconium (Zr), and zinc glasses (Anusavice et al., 2013).

#### 1.3.2.3 Coupling Agent

Coupling agent is used to combine reinforcing phase and matrix phase. The most commonly used coupling agent is a silicon organic compound called silane coupling agent,3-metakrilloxipropiltrimetoksisilan(MPTS) Composite with low shrink silorane monomer epoxy,3-glycidoxypropyltrimethoxysilane, is used to bind filler to oxirane matrix (Craig, 2006).

### 1.3.2.4 Photo initiator

The polymerization process of composite resin starts with releasing free radicals from methacrylate monomer structure which requires an external energy in the form of heat, chemical, or radiant energy.Chemical activation resin consists of two pastes. One paste consists of benzoyl peroxide initiating material, and the other paste consists of tertiary amine activator. Currently, the most common photoinitiator is camphorquinon, which has canary yellow color which results in yellowish composite restoration. Light absorption which appears in camphorquinone is in the range of 425 – 495 nm(Anusavice et al., 2013)

### 1.3.3 polymerization process of composite resin

Nearly all types of composite resin use monomer types in the same group and the same polymerization process which occurs by the conversion of the monomer molecules into a polymer network, accompanied by a closer packing of the molecules, causing contraction in the composite (Manhart J et al., 2001). The polymerization process of composite resin starts with releasing free radical from methacrylate monomer structure an external energy in the form of heat, chemical, or radiant energy. When free radical is formed, the monomer looks for the electron-rich monomer to form covalent bond. The combination of those monomers forms a new polymer Based on the activation energy, composite resin is classified into two type, i.e. chemically activated and light activated composite resins.(fig.1)(fig.2),(Noort, 2007).

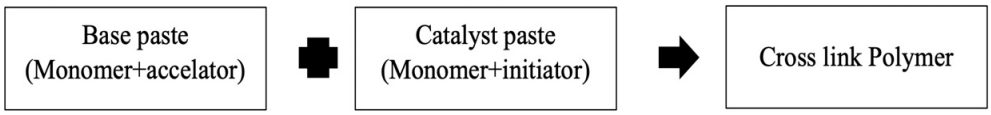


**FIGURE 1.** Chemically activated composite resin (chemical polymerization)

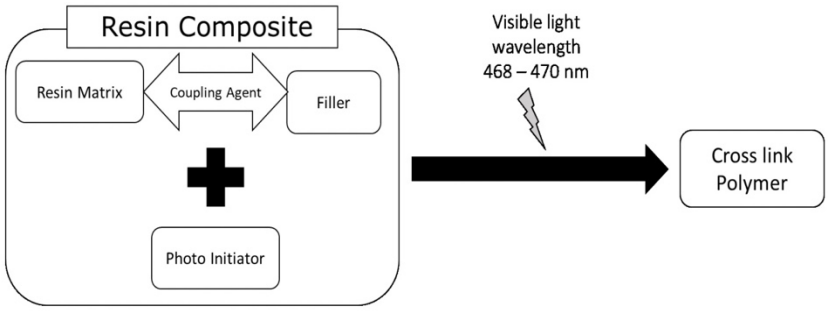


**FIGURE 2.** Light activated composite resin (photopolymerization)

### 1.3.4 classification of composite resin

#### 1.3.4.1 Macrofilled

Macrofilled composite resin or traditional composite resin contains quartz filler and strontium or barium glass. The filler particles are 10 – 100 µm. The filler of macrofilled composite resin has relatively large size and hard, thus difficult to polish and may cause antagonist tooth to be eroded during contact (Spiller et al., 2002).

#### 1.3.4.2 Microfilled

Microfilled In the late 1970, microfilled composite resin was developed. This resin has particle between 0.04 – 0.2 µm with filler loading of 30% wt. To increase filler loading up to 30 – 50 % wt., pre-polymerization resin was grinded with colloidal silica particles and also combined with resin matrix and micro-sized filler particle.Microfilled composite resin has advantage of having high polishability compared with other composite resins. Increasing filler loading in microfilled composite resin reduces polymerization effect. This composite resin has disadvantages of not being able to be used as stress-bearing surfaces restoration material due to the weak bond between composite particle and matrix (Alla et al., 2014).

### 1.3.4.3 Hybrid composite

Hybrid composite resin is a combination of macrofilled and microfilled. When it was first introduced, it had particle size of 15 – 20 μm and colloidal silica particle size of 0.01 – 0.05 μm.The combination of two filler types aims to combine the physical properties of macrofilled composite resin with the smooth polishing surface of microfilled composite resin. Hybrid composite resin has good wear resistance and mechanical properties so it could be used for dental restoration which requires high stress – bearing ability (Craig, 2006).

### 1.3.4.4 Nanofilled

Nowadays, advances in nanotechnology produces composite resin which has nanoparticle of 25 nm and agglomerate nanoparticle 75 nm. Zirconium/silica and nanosilica particle is used as filler in nanofilled. Agglomerate particle is silanized so it can bond with resin. Combining nanoparticle with agglomerate nanoparticle increases the filler loading of composite resin up to 79.5%. The increasing filler loading occurs because of lower dimension and area distribution of filler particle. Increasing filler loading leads to reduced polymerization shrinkage and increased the mechanical properties of composite resin (Geraldi S et al., 2003),(García et al., 2006).

### 1.3.4.5 Short Fiber Reinforced Composite

Short fiber reinforced composite resin is used as one of dental restoration materials. Adding 5% - 7.5% of short fiber filler into filler particle composite resin with filler loading of 60% wt.reduces polymerization shrinkage by 70%.This filler increases the physical properties of composite resin, e.g. flexural strength, modulus, and work of fracture. Moreover, filler short fiber also increases stress bearing in application of posterior dental restoration.The most commonly used short

fiber reinforced type is glass fiber. Various types of polymetric fiber are also developed as composite resin filler, including poly (vinyl acetate) fibers, polyethylene and aramid fibers, and nylon 6 fibers (Habib et al., 2017).

### 1.3.5 Mechanical Properties of composite restoration

Composite restorations possess a range of mechanical properties, which include:

**1.3.5.1 Compressive strength**: The ability to withstand compression forces without breaking. The compressive strength requirement for composite restorations varies depending on their location and function in the oral cavity. The compressive strength should be high enough to withstand the masticatory forces and prevent fracture or deformation. For example, anterior restorations require a compressive strength of at least 150 MPa, whereas posterior restorations require a higher strength of 300-400 MPa. However, these values are not set in stone and may vary depending on the patient's occlusion, age, and other factors. It is essential to achieve an optimal balance between strength and aesthetics while selecting and placing composite restorations (Bhanu Pratap et al., 2020).

**1.3.5.2 Tensile strength:** The ability to resist forces that pull apart or stretch the material. The tensile strength of composite restorations depends on various factors such as the type and quality of the composite material used, the bonding technique, the curing method, and the size and location of the restoration. Generally, the tensile strength of composite restorations ranges from 40 to 120 MPa. However, it is important to note that the tensile strength alone may not be a sufficient indicator of the overall strength and durability of a composite restoration, as it may not accurately reflect the resistance to other types of stresses that the restoration may encounter in the oral environment (Alster D et al., 1995).

**1.3.5.3 Flexural strength:** The ability to resist bending or flexing forces.

It depends on several factors such as the composition of the composite material, the thickness of the restoration, the type of substrate it is bonded to, and the curing process.

Composite materials consist of a resin matrix and fillers that provide strength and wear resistance. The type, size, and amount of filler particles affect the flexural strength of the composite material. Higher filler content and smaller particle size generally result in increased flexural strength.

The thickness of the restoration also affects its flexural strength. Thicker restorations generally have lower flexural strength due to the increased risk of internal stresses and defects.

The type of substrate the composite restoration is bonded to can also affect its flexural strength. A well-prepared enamel surface will provide better bonding and improved flexural strength compared to a dentin surface.

Finally, the curing process can also impact the flexural strength of the composite restoration. Proper curing ensures complete polymerization of the resin matrix, resulting in optimal strength and durability. Factors such as light intensity, exposure time, and distance from the light source can influence the curing process and final flexural strength of the restoration **(**Göhring TN et al., 2005).

**1.3.5.4 Hardness:** The ability to resist surface indentation or scratching. Generally, a denser and more highly cross-linked composite restoration will have a higher hardness and better wear resistance (Khalidi et al., 2015).

**1.3.5.5 Wear resistance:** The ability to withstand wear and tear caused by chewing and other mechanical forces. Advances in material science and composite formulations have led to the development of highly wear-resistant composites that are capable of withstanding the rigors of daily use. Factors that can influence the wear resistance of a composite restoration include its

composition, the size and shape of the filling, the location of the restoration within the mouth, and the patient's oral hygiene habits (Tsujimoto A et al., 2018).

**1.3.5.6 Bond strength:** The ability to adhere to the tooth structure. A typical range of bond strength for anterior composite restoration is around 20-35 MPa, which can be influenced by factors such as moisture contamination, contamination by oral fluids or contaminants, and stress concentration.

Generally, composite materials have good mechanical properties when compared to other dental materials such as amalgam. However, their properties may vary depending on the type of composite material used, the method of placement, and the curing technique employed (Ronald L & Sakaguchi, 2012).

### 1.3.6 Factors affect on dentist choice of composite brand

Dentist may choose specific brand of composite due to one or more of these reasons:

1- Quality of the material: Dentists might prefer a particular composite brand based on the quality of the material, such as its strength, durability, and resistance to wear and staining (Ronald L & Sakaguchi, 2012).

2- Aesthetics:Anterior composite restorations are often used for cosmetic purposes, and dentists may choose a brand based on its ability to produce natural-looking results (Nohl et al., 2002).

3- Ease of use: Dentists may prefer a composite brand that is easy to handle and manipulate during the placement process, allowing them to achieve optimal results efficiently (Shimokobe H et al., 1972).

4- Price: The cost of different composite brands can vary, and dentists may choose a brand that offers a good balance between quality and affordability (Steffen Mickenautsch, 2002).
5- Brand reputation: The reputation of a composite brand within the dental community can also play a role in a dentist's decision-making process. They may prefer to use a brand that is well-known and has a proven track record of success (Lawson NC & Janyavula S, 2021).

Ultimately, the choice of composite brand may vary depending on the individual preferences and experiences of each dentist.

### 1.3.7 Clinical Performance of composite restoration

The clinical performance of composite resin refers to how well the material performs in the mouth in terms of durability, esthetics, and function. When evaluating the clinical performance of composite resin, dentists look at various factors, including the following:

1- Bonding strength: The ability of the composite resin to bond effectively to the tooth structure is crucial for its success. A strong bond ensures that the restoration stays in place and resists fracture and wear (Ronald L. Sakaguchi et al., 2012).
2- Marginal integrity: The interface between the composite resin and the tooth is critical to the success of the restoration. The margin should be smooth and continuous, without any gaps or defects, to prevent leakage of bacteria and other harmful substances into the tooth (J.F.& Roulet, 1994).
3- Wear resistance: Composite resin should be able to withstand the forces of chewing and grinding without wearing down too quickly. A restoration that wears down too quickly can lead to the need for replacement sooner than desired (Tsujimoto A et al., 2017).

4- Color stability: Composite resin should retain its original color and not discolor or stain over time. Discoloration can affect the esthetics of the restoration, making it less attractive (Catelan A et al., 2011).
5- Longevity: Composite resin should be durable and long-lasting, ideally lasting for several years before needing replacement (Hellyer, 2022).

Overall, the clinical performance of composite resin is an essential consideration for both dentists and patients when deciding on the best restorative material for a particular dental condition.

**1.3.8 Failure of anterior composite restoration:**

The mode of failure of an anterior composite restoration refers to how the restoration fails or breaks down over time.

There are several possible modes of failure that can occur with anterior composite restorations, including:

1- Marginal staining: This occurs when there is leakage or seepage around the edges of the restoration, leading to discoloration of the surrounding tooth structure (*Fig.3*) (S N Deviyanti et al,. 2018).

**Figure 3: Marginal staining**

2- Marginal gap formation: This happens when there is a separation between the composite and the tooth structure, allowing bacteria and fluids to penetrate underneath the restoration (M. Irie & K. Suzuki, 2001).

3- Composite chipping or fracturing: This can occur when the composite material becomes weakened or overloaded, causing it to chip or break off (Fig.4) (Brandeburski, 2020).


**Figure 4: Composite chipping or fracturing**

4- Secondary caries: This refers to the formation of new decay around the restoration due to bacterial infiltration and accumulation (fig.5) (Feng X, 2014).

**Figure 5: secondary caries**

5- Wear or erosion: Over time, the composite material may wear away or erode due to mechanical or chemical factors, such as abrasive toothbrushing or acidic foods and beverages (Tsujimoto A et al., 2018).

6- Discoloration: Discoloration of composites of anterior restorative work is an aesthetic disaster for the patient. And many times it's a reason for retreatment of previous dental work.Composite discoloration can be quite common and can be caused by various reasons. One of the main reasons discoloration of the composite over time can occur is inadequate polishing of the composite. A multistep, accurate, polishing system is mandatory to keep the composite color stable as much as possible. Other co-factors in discoloration are patient habits (food, drinks, smoking e.g.), inadequate or no etching around and beyond the preparation or fracture line or insufficient polymerization of the composite (fig.6)(Catelan A et al., 2011).

**Figure 6: Discoloration**

The mode of failure of an anterior composite restoration can depend on a variety of factors, such as the type and quality of the composite material, the skill and technique of the dentist, and the patient's oral hygiene habits and dietary choices. Proper placement and maintenance of the restoration can help minimize the risk of failure and ensure optimal long-term outcomes.

### 1.3.9 Esthetic of dental composites

Producing a biomimetic match between restorative materials and natural teeth involves not only knowledge and manual ability but also

psychology and even philosophy. Many aspects are involved to perfectly reproduce a natural tooth, such as proper form, anatomy, contour, color, gloss, texture, translucency, fluorescence, and opalescence. color can be specified based on three color appearance parameters, also known three color dimension; hue, value (or lightness) , and chroma (v.miletic ed, 2018).

**1.3.9.1 Hue**: is defined as the visual perception of the stimuli of a wavelength. As illustrated in Fig. the main pure hues are red, blue, and yellow. The main pure hues are also called primary colors. However, the mixture of pure hues can generate different visual perception stimuli, also called secondary colors. For example, the mixture of blue (primary color) and yellow (primary color) generates the visual perception of green (secondary color). The mixture of a primary color and a secondary color can also generate a different visual perception stimulus, called a tertiary color (fig.7) (D. Oliveira,2018).


**Figure 7: Hue**

**1.3.9.2 Value**: It is lightness or tone, is referred to the lightness or darkness of a color. In other words, it indicates the quantity of the light that is reflected. (fig.8) (D. Oliveira,2018).

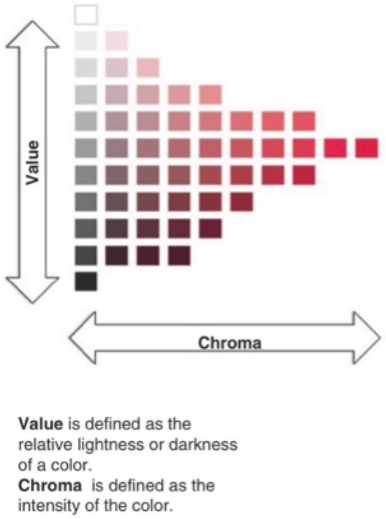


**Figure 8: value and chroma**

**1.3.9.3 Chroma:** Defined as the purity, intensity, or saturation of a color. Thus, a lower chroma would indicate less intensity of the color, as in pastel colors, while a higher chroma is related to a more vivid color (fig.8) (D. Oliveira,2018).

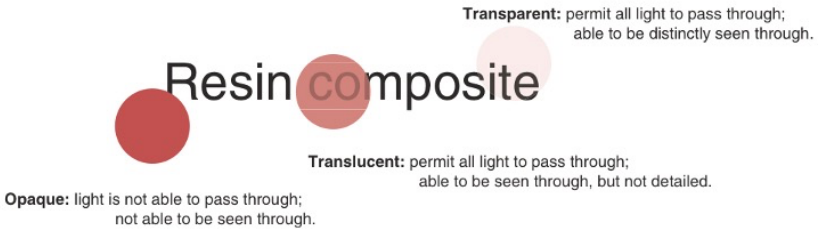


**Figure 9: optical properties**

### 1.3.10 Shade selection

Before selecting materials designed to mimic natural teeth it is essential to understand how the optical properties of the various tooth layers influence overall colour.Enamel, dentine, pulp and the dentino-enamel

junction (DEJ) all possess different optical properties, which are determined by their composition, structure and relative thicknesses. These tissues are constantly evolving via dynamic interaction with the extrinsic and intrinsic environments via numerous exchange processes. Numerous natural colour changes occur throughout life(fig.10) (Touati B et al., 1999).


**Figure 10 : shade selection**

### 1.3.10.1 Dentine

In terms of color, dentine may be considered the most important layer. It provides most of the tooth's hue which falls in the yellow/red portion of the spectrum. In natural teeth, light passes through the translucent enamel and is reflected from the yellowish, relatively opaque dentine, which is approximately 20% less translucent than enamel·Dentine color varies from patient to patient and from tooth to tooth and changes throughout life. These variations are influenced by its composition, which is mainly mineral hydroxyapatite crystals (70%) supplemented by organic material (20%) and water (10%). The organic component is partly responsible for making dentine opaquer than enamel. Opacity is further increased by its tubular structure which deflects some of the light rays entering the tooth (Dale BG,1993).

### 1.3.10.2 Enamel

Enamel is 95% mineral (5% water and organic components) resulting in largely translucent optical properties. The overall appearance of enamel depends on a complex interaction of factors such as composition, thickness, translucency, opacity, characterization and intensive colors (Dale BG,1993).

### 1.3.11 Shade selection technique

There are many techniques to select most appropriate shade,

### 1.3.11.1 Shade guide (Vita shade guide)

Shade guide structured on hue and chroma repositioned in value order **(**Fig.11).

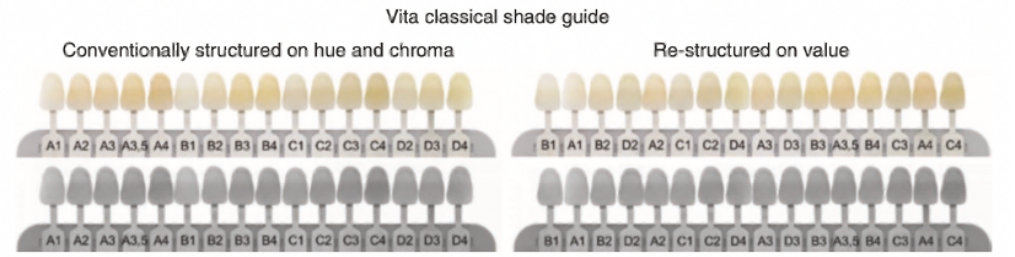


**Figure 11: VITA shade guide**

### 1.3.11.2 Colorimeters and spectrophotometers:

Colorimeters and spectrophotometers process the light reflected from the tooth and calculate it into color parameters. (Fig.12).

**Figure 12: Spectroshade**

### 1.3.11.3 Try button technique:

Color matching and analysis must be performed before rubber dam isolation when the teeth are fully hydrated, otherwise, there is a high risk of mismatching color by choosing one that's whiter than appropriate.

Place small increments of composite on the cervical and incisal portion.Then taking photo by using mobile or professional camera (DSLR camera is preferred).

High chromatic composite placed in the cervical portion to determine the shade of dentin layer. high value composite placed in incisal portion to determine shade of enamel layer(fig.14-A) light cure application on both layers, then taking a photo using polarized lens (fig.13) to prevent light reflection from teeth surface. By using picture settings:

**Figure 13: Polarized photo lens**

1- Increase pic. Saturation and reduced contrast as much as possible to select dentin layer shade. (fig.14-A).

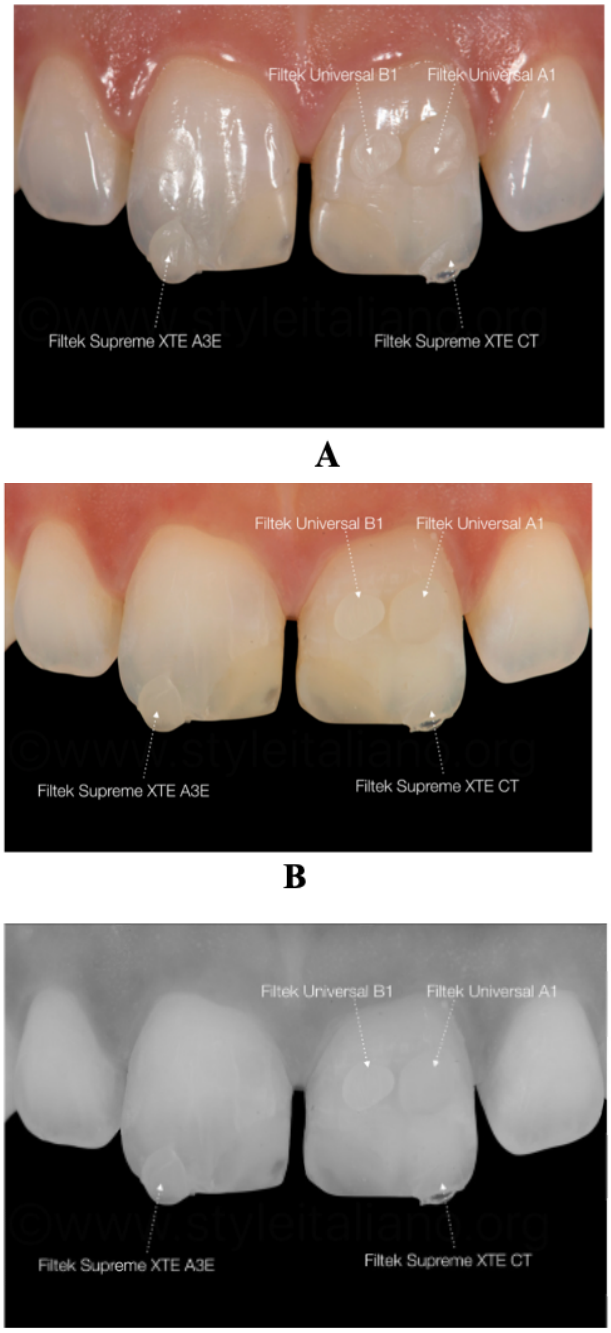


**Figure 14: Try Button technique**

2- Reduce value or brightness to select enamel shade (Fig.14-C)
Select the most suitable shade for each layer. It is recommended to complete this procedure in a few minutes to avoid tooth dehydration which is affect on the optical properties. (D. Oliveira.2018).

### 1.3.12 Material selection

As with any restorative procedure, a thorough understanding of materials science enables selection of composite resins suitable for each clinical situation and optimizes the restoration of function and aesthetics. A wide range of composites is available for the restoration of anterior teeth, all with subtly different formulations, which can be confusing. Prior to purchase, practitioners are recommended to study, test and select materials based on their fundamental physical properties rather than focusing on their marketing literature. Filler content determines a material's mechanical properties and influences volumetric shrinkage. As with posterior composites, hybrid materials are commonly used, as their combination of large and small filler particles provides the strength necessary to withstand functional forces (Vanini L,2010).

### 1.3.13 Techniques of anterior composite application

#### 1.3.13.1 Mono shade technique (placement technique) (single shade technique)

The mono shade technique of anterior composite restoration is a method involving the use of a single shade of composite material to create a natural-looking restoration on the front teeth. This technique is commonly used when restoring a single tooth that is visible when a person smiles or speaks.

The process begins with the preparation of the tooth surface by cleaning, drying, and etching. Next, a bonding agent is applied to the tooth surface to create a strong bond between the composite material and the tooth. Once the bonding agent has been applied, the composite material is placed in a single layer over the prepared tooth surface.

The composite material is then shaped and contoured to match the natural shape of the tooth, while also ensuring that the restoration is flush with the surrounding teeth. (fig.15) After the initial shaping, the composite material is cured, which hardens the material and ensures that it is bonded securely to the tooth surface.The final step in the single shade technique of anterior composite restoration involves polishing and refining the restoration to achieve a natural-looking and smooth finish. This involves using a series of polishing tools to buff the restoration and remove any rough spots or imperfections. (fig.16).

**Figure 15: Single shade technique**
**Case courtesy of Dr. Ahmed Saad**

Benefits of the single shade technique of anterior composite restoration include its ability to create a natural-looking restoration quickly and efficiently. Additionally, this technique requires less time in the dental chair compared to traditional composite restoration methods, making it a popular choice for patients who may have a busy schedule or who are anxious about dental treatment. (Newteen Fahl Jr, 2023)

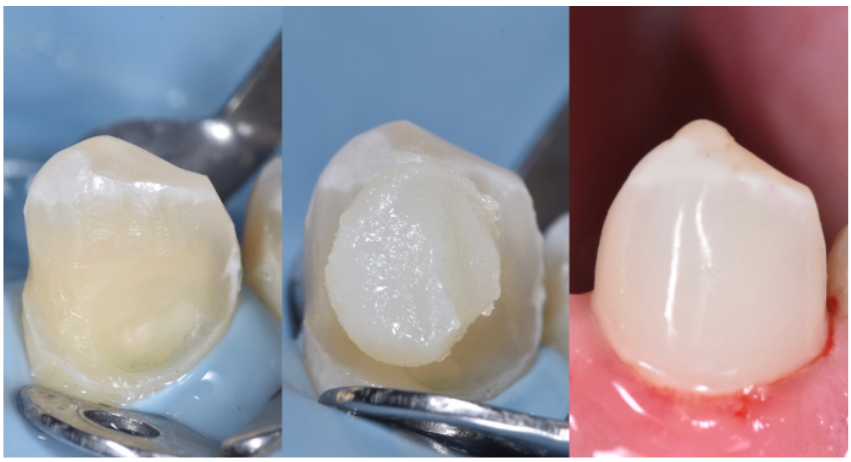

**Figure 16: Single shade technique**
**Case done by Mohammed Wissam**

### 1.3.13.2 Polymorphic layering technique

The layering technique is a popular approach to achieve a natural-looking aesthetic result for anterior composite restorations. It involves applying composite resin material in multiple layers, each with a specific shade and translucency, to mimic the appearance of the surrounding natural teeth.

The layering technique starts with the etching of the tooth surface, followed by the application of a bonding agent to promote adhesion of the composite resin to the tooth. Then, a thin layer of dentin shade composite resin is applied to the prepared tooth surface.

Next, the practitioner will use a shade guide to match the color of the adjacent teeth and select the appropriate composite resin for the next layer.

With each layer, the dentist will use different shades and translucencies that mimic the natural tooth structure of enamel and dentin.

After each layer, the composite is light cured to harden the material, allowing for the next layer to be added. The dentist can achieve various shapes and contours by carving and shaping each layer of composite, creating a more realistic and natural-looking result.

The final layer of composite is typically the enamel layer, which is the thinnest and most translucent layer, giving the restoration a more natural appearance. The composite is shaped and polished to match the surrounding natural teeth, and the result is a seamless restoration that blends in with the patient's smile. (Newteen Fahl Jr, 2023) Overall, the layering technique in anterior composite restoration requires skill and attention to detail to achieve a natural-looking, aesthetically pleasing result. Each layer must be carefully placed, shaped, and polished to create an optimal restoration that matches the surrounding natural teeth.


**Figure 17: layering technique**

## 2-Subject and Methods

Online questionnaires were used to ask 103 dentists of both genders (58 males,45 females) about their preference of composite brand. All dentists included in this study were practicing private dental work and performing anterior composite restorations in their practice. The questionnaires are shown in Appendix 1

The protocol designed for this study was approved by the College of Dentistry/ Ibn Sina University of Medical and Pharmacological Sciences, the data was collected within period extended from (11/11/2022) to (13/4/2023) and presented in the tables and figure.

# 3- Result

## 3.1 Result

### Table 1: Demographic Variables of dental personnel

The total number of participating is 105 sample.

- This table revealed gender and specialty of surveyed dentists. The number of males is 58(56.3%) and the number of females 45(43.7%).
- General dentist had the largest percentage of the questionnaire (68%) followed by cosmetic dentist (10.5%) followed by maxillofacial surgeons (8.6%) and other specialties.

| **Gender** | **No.** | **%** |
|---|---|---|
| **Male** | 58 | 56.3 |
| **Female** | 45 | 43.7 |

| **Specialties** | **GP** | **Cosmetic dentist** | **pedodontics** | **Maxillofacial surgeons** | **Orthodontists** | **Others** |
|---|---|---|---|---|---|---|
| **No./ %** | 72(68.6) | 11(10.5%) | 3(2.9%) | 9(8.6%) | 5(4.8%) | 4.6% |

### Table 2: period of practice in anterior composite:

This table revealed the practice period of surveyed dentists. The largest percentage had less than one year of experience in anterior composite .

| **Period** | **Less than 1 years** | **2-3 years** | **4 years or above** |
|---|---|---|---|
| **No. / %** | 35 (34%) | 35(34%) | 33(32%) |

**Table 3: Number of anterior composite cases per week:**

This table revealed the number of anterior composite cases that dentist do per week. The largest percentage was 54.4% with 1-3 cases of anterior composite cases per week. Followed by 25.2% with 3-5 cases, then 12.6% with 10 or more cases followed by 7.8% with 5-10 cases per week.

| **Cases** | **1-3** | **3-5** | **5-10** | **10 or more** |
|---|---|---|---|---|
| **No. / %** | 56(54.4%) | 26(25.2%) | 8(7.8%) | 13(12.6) |

**Figure 18** show the techniques of anterior composite application. The most surveyed dentists using layering technique (76.7%) followed by single shade technique (23.3%).

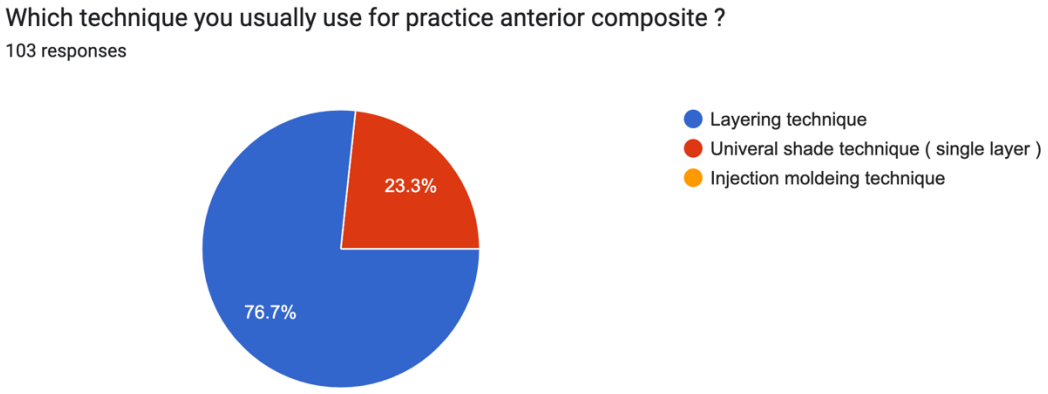


**Figure 18: - Techniques of anterior composite application.**

**Table 4: Most favorable composite brand used in anterior composite**

This table revealed the most favorable composite brand used in anterior composite. The largest percentage of surveyed dentists chose Tokauyama PALFIQUE LX5 (24.3) followed by GC Essentia 13.6% then other brands.

| **Brand Name** | **No./%** |
|---|---|
| Tokuyama PALFIQUE LX5 | **25(24.3)** |
| GC Essentia | **14(13.6)** |
| GC G-ænial™ A'CHORD | **10(9.7)** |
| Shofu Beautifil II | **10(9.7)** |
| 3M™ Filtek™ Supreme Ultra Universal Restorative Single Shade | **9 (8.7)** |
| Tokuyama ESTELITE® SIGMA QUICK | **6(5.8)** |
| Tokuyama PALFIQUE OMNICHROMA | **7(6.8)** |
| 3M™ Filtek™ Z350 Universal Restorative | **8(7.8)** |
| 3M™ Filtek™ Z250 Universal Restorative | **3(2.9)** |
| Style Italiano professional CompoSite | **3(2.9)** |
| Tokuyama PALFIQUE ASTERIA | **5(4.9)** |
| ENA HRi® | **1(1)** |
| Ivolclar Tetric N-Ceram | **1(1)** |
| FGM Vitra | **1(1)** |
| Dentsply Sirona Neo Spectra ST LV | **0** |

**Table 5: Causes that dentist prefer selected brand**

This table revealed the reasons of choosing brand of composite. Handling and adaption, shade matching was the main reasons for choosing the composite brand (64.1%), following by strength, polishability and other reasons.

| Causes | No. | % |
|---|---|---|
| **Handling and adaptation** | **66** | **64.1%** |
| **Shade matching** | **66** | **64.1%** |
| **strength** | **42** | **40.8%** |
| **Polishability** | **50** | **48.5%** |
| **cost** | **17** | **16.5%** |
| **Carveability** | **12** | **11.7%** |

**Table 6: Common modes of failure:**

This table revealed the modes of failure of anterior restorations. The common modes of failure was discoloration (35%) followed by loss of luster (18.4) followed by other modes.

| Modes | No. | % |
|---|---|---|
| **Discoloration** | **36** | **35%** |
| **Loss of luster** | **19** | **18.4%** |
| **Marginal staining** | **18** | **17.5%** |
| **Sensitivity** | **18** | **17.5%** |
| **Restoration fracture** | **15** | **14.6%** |
| **chipping** | **11** | **10.7%** |
| **Wear** | **6** | **5.8%** |

**Figure 19:** show the period of follow up cases of surveyed dentists.

The most of dentists had less than 6 months follow up cases (40.8%) followed by 6 months – 1 year (35%) then 1-3 years (14.6%), and more than 3 years follow up with (9.7%)

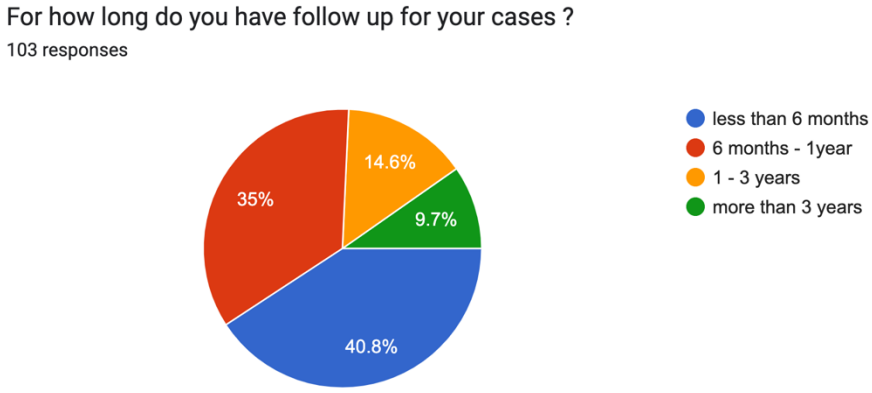


**Figure 19: Period of follow up cases in anterior composite**

**Discussion:**

After reviewing the demographic variables of the surveyed dentists, it was found that the sample included a greater number of general dentists compared to cosmetic dentists. Perhaps larger number of cosmetic dentists can give different results. The study also revealed that when selecting their preferred brand, the surveyed dentists considered factors such as handling, adaptations, and shade matching (64.1%), as well as polishability (48.5%) and strength (40.8%), more important than cost or other factors.

According to the survey results, the brand most frequently chosen by dentists was Tokuyama PALFIQUE LX5, with a selection rate of 24.3% (25 respondents). This preference can be attributed to various factors, including the product's high polishability because of supra-nano spherical fillers provide very smooth surface for a superior shine and high gloss retention also availability and affordable price due to brand's marketing claims regarding other advantageous properties may have also played a role in its popularity among the surveyed dentists (Tokauyama Dental R&D).

While GC Essentia came second with (13.6%). Essentia GC feature an innovative composition with a mix of ultra-fine glass fillers and high-performance prepolymerised fillers. They display an excellent polishability and gloss retention, as well as perfect translucency and a small amount of opalescence (Gc Europe N.V). Nevertheless, we would say that Essentia GC has a drawback of having loads of shade tubes that the dentist has to acquire to fully reach the aesthetic needs. According to the survey findings, the layering technique is the most commonly practiced technique among dentists, with a majority of 76.7% respondents reporting its use. This preference could be attributed to the fact that this technique allows for more aesthetically pleasing results since we can efficiently manage to mimic the

natural tooth structures like mamelons and translucencies in comparison to other techniques. Based on the survey responses, the most commonly reported mode of failure during follow-up visits was discoloration, with 35% of dentists reporting this issue and this might be owing to the patients concerning about their aesthetic more than other factors. Loss of luster and marginal staining were also reported, with rates of 18.4% and 17.5%, respectively. It is important to note that while these issues can be attributed to the restorative material used, patient habits such as smoking and the consumption of coffee or tea can also contribute to these problems. Therefore, a comprehensive approach that addresses both the material and patient habits is necessary to prevent and address these issues.

## Conclusion

1. Iraqi dentists emphasize more on handling, adaptation and shade matching when choosing a composite material
2. Although a variety of dental composite brands are available now a days Iraqi dentists preferred *Tokuyama PALFIQUE LX5* over other brands
3. Layering technique is the most preferred method of application among Iraqi dentists
4. Aesthetics is the number one concern for both dentists and patients when it comes to anterior fillings

## Recommendations:

These suggestions for the incoming researchers to inspire studies under the same aims, includes:

1- Using larger sample size with specialized dentists to reduce the possibility of error.

2- A longitudinal study is needed for more precise results

3- Comparative study between dentists working in private clinics in the center of Iraq and dentists in the periphery

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Appendix 1

Q1: - Gender ?

- Male
- Female

Q2: - What is your specialty ?

- Genersl Dentist
- Cosmetic dentist
- Pedodontist
- Periodontist
- Orthodontist
- Maxillofacial surgery

Q3: - How long you have been in practice of anterior composite .

- Less than 2 years
- 2-3 years
- 4 years or more

Q4: - How many cases of anterior composite you do per week?

- 1-3 cases
- 3-5 cases
- 5-10 cases
- 10 cases or more

Q5: -Which technique you usually use for practice anterior composite?

- Layering technique
- Universal shade (mono , single shade technique)

Q6: - what is your most favorable composite for anterior teeth?

- GC G-ænial™ A'CHORD
- 3M™ Filtek™ Supreme Ultra Universal Restorative Single Shade
- Tokuyama ESTELITE® SIGMA QUICK

- GC Essentia
- Shofu Beautifil II
- Style Italiano professional CompoSite
- Ivolclar Tetric N-Ceram
- Dentsply Sirona Neo Spectra ST LV
- Tokuyama PALFIQUE OMNICHROMA
- 3M™ Filtek™ Z350 Universal Restorative
- FGM Vitra
- 3M™ Filtek™ Z250 Universal Restorative
- Tokuyama PALFIQUE LX5
- ENA HRi®
- Tokuyama PALFIQUE ASTERIA

Q7: - Why do you prefer this brand of composite ?

- Handling and adaptation
- Shade matching
- strength
- Polishability
- cost
- Carveability

Q8: - In your opinion ,what are the weakness points in selected brand ?

- Handling and adaptation
- Shade matching
- strength
- Polishability
- cost
- Carveability

Q9: - For how long do you have follow up for your cases ?

- Less than 6 months
- 6months -1 year
- 1-3 years
- More than 3 years

Q10: - What are the common modes of failure that occurs with the brand you use?

- Discoloration
- Loss of luster
- Marginal staining
- Sensitivity
- Restoration fracture
- chipping
- Wear

Q11: - Give me one reason that for you preferd this brand over ther others (optional)

## الخلاصة:

**الخلفية:** في السنوات الأخيرة، كان هناك تحول ملحوظ في إجراءات طب الأسنان الترميمي ، وفهم تفضيلات أخصائي طب الأسنان فيما يتعلق بمواد الحشوات الأمامية يعد أمراً حيوياً لتعزيز النتائج السريرية ورضا المريض. فمن خلال اكتساب نظرة ثاقبة للعوامل التي تؤثر على اختيار المواد، يمكن أن تساعد نتائج هذا البحث في تحسين اختيار الحشوات الأمامية في مجتمع طب الأسنان العراق
**الهدف:** الهدف الأساسي من هذا البحث هو استكشاف تفضيل مواد الحشوات الأمامية المختلفة بين أطباء الأسنان المتخصصين العراقيين
**العينة والطريقة**: دراسة وصفية مقطعية مبنية على استبيان عبر الإنترنت شارك في البحث حوالي ١٠٣ طبيب أسنان من كلا الجنسين (٥٨ ذكور و٤٥ إناث).
النتائج: فضل غالبية أطباء الأسنان خصائص مثل المناولة والتكيف ومطابقة الظل (٦٤.١٪)، وكذلك القابلية للتلميع (٤٨.٥٪) والقوة (٤٠.٨٪) عند اختيار مواد الحشوات الأمامية.
**الاستنتاج:** (توكاياما بالفك ال اكس فايف) كانت بمعدل اختيار ٢٤.٥٪، هي مادة الحشوة الامامية الاولى المختارة بين أطباء الأسنان العراقيين الذين قمنا باستطلاع رأيهم واستخدام تقنية طبقات التطبيق كأفضل تقنية تم اختيارها


.

جمهورية العراق
وزارة التعليم العالي والبحث العلمي
جامعة ابن سينا للعلوم الطبية والصيدلانية
كلية طب الاسنان

# تفضيلات مواد الحشوات الامامية المختلفة لدى أطباء الاسنان الاخصائيين العراقيين

مشروع تخرج مقدم لفرع العلوم السريرية - كلية طب الاسنان-جامعة ابن سينا للعلوم الطبية والصيدلانية لتحقيق جزء من متطلبات درجة البكالوريوس في علوم طب الأسنان

مِن قِبل:
محمد وسام عبد العزيز
مينا عمر علي
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بأشراف :
المدرس المساعد الدكتور محمد قاسم محمد

١٤٤٤-١٤٤٥ هـ ٢٠٢٢-٢٠٢٣ م.