



INTRODUCTION TO DENTISTRY



LEC NO. : 4

DONE BY : Asia Al-wedyan.

وَقُلْ رَبِّ زِدْنِي عِلْمًا

Introduction to Dentistry

lecture 4: Materials used in Dentistry

By Heba Ali (DDS, MSc, PhD)

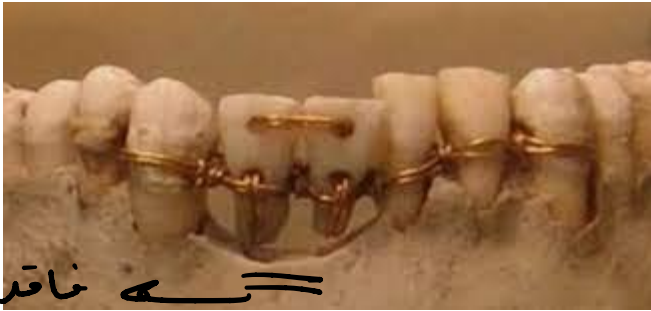
Dental materials

Physical// chemical// biological

- It is the study of **composition** and **properties** of materials used in dentistry and the way they interact with the oral environment: → Oral cavity
- The oral cavity is considered to be the **harshest environment** for a material in the body (temperature, ph, saliva, plaque, forces...). Oral cavity presence the bacteria and the occlusal forces.
قوى الال طباطة .
- Every dentist (and dental assistants) should have **basic knowledge** of the materials used in Dentistry
- The practice of clinical dentistry depends not only on a complete understanding of the various clinical techniques but also on an appreciation of the basic biological, chemical, and physical characteristics of the dental materials in calinical applications.
تدبير

History of dental materials

- Humans have been making and using dental appliances and dental implants for thousands of years



للكل الأسنان من الاعمال
مخاطب

- Restoration of the dentition with the patient's teeth using gold wire ancient egypt around 2500 bc

they used prosthodontics (الاستعاضة السنية)



← Denture
(سنة + قبة)

صفات

Characteristics of dental materials

• It should be:

Can be used in humans

1. **Biocompatible** (non-toxic, non-irritating, non-allergic) مقاوم للكسر
2. **Mechanically stable and durable** (strong, resistant to fracture)
3. **Resistant to corrosion** (does not deteriorate overtime) مقاوم للتآكل
4. **Dimensionally stable** (little or no change to temperature and solvents) ثابت الأبعاد و لا يتأثر بالحرارة او غيره
5. **Aesthetic** (looks like normal oral tissue) الشكل التجميلي يكون مقارب للحقيقه
6. **Minimal conduction** (insulates against thermal/ electrical change)
7. **Easy to manipulate** غير موصل للحرارة او الكهرباء

Classification of Dental materials

- Dental materials can be classified as:

د تالیه

1. Preventive dental materials

2. Restorative dental materials

- Direct ^{ترمیم}
- Indirect

3. Auxiliary dental materials

عائد / اضافی / احتیاطی

The classification of dental materials is not very straight forward!

یعنی قد یصیر علی ال materials تعديلات
تحويلها من preventive ل restorative

Preventive dental materials

سير الامور للوصول لتسوس الاسنان

- Aim: to prevent or inhibit the progression of tooth decay

1. Pit and fissure sealants

fissure sealants are a protective layer applied to the fissures in your teeth to prevent tooth decay.

2. Fluoride treatment:

3. Mouthwashes and cavity varnishes

Pit and fissure sealants

- حصرة
- Pits and fissures of the occlusal surfaces of the posterior teeth are more prone to caries development than the smooth surfaces due to their morphological complexity.

- سيال
- The use of pit and fissure sealants provides a physical barrier that inhibits microorganisms and food particles accumulation, تمنع من تجمع الاكل في حفر الطواحين preventing caries initiation, and arresting caries progression .

Pit and fissure sealants



بتصير انعم فما بتجمع اكل



Fluoride treatment

- Professionally applied fluoride therapy to prevent and arrest caries in children and adults.

↓ تسوس

- Early childhood caries remains highly prevalent in many countries.

منتشر

بلدان

غير كافية

- Routine tooth brushing is inadequate in cleaning

- (The mechanism of action) of fluoride is the
 - ① inhibition of demineralization and
 - ② enhancement of remineralization

1- تثبيط ازالة المعادن

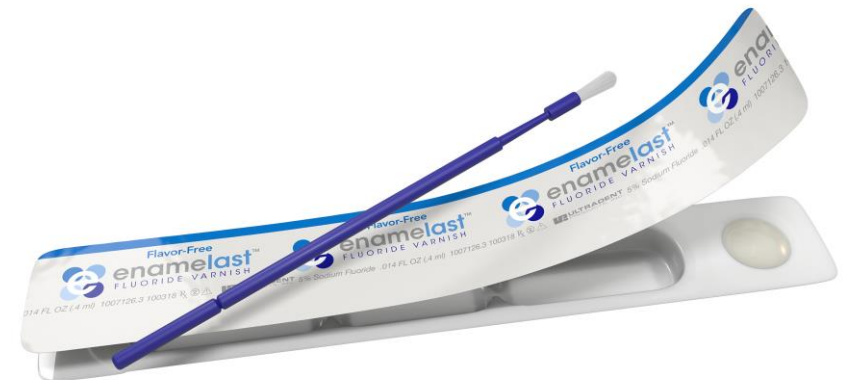
2- remineralization تعزيز عملية ال-

- Sodium fluoride (NaF) 5% varnish is a professional topical fluoride

الصوديوم فلورايد هو طلاء موضعي

Remineralization occurs when vital minerals—like calcium—bond to the teeth to fill in the weakened areas of enamel.

المناطق الضعيفة لدينا الاسنان



الآلية العمل

to repair damaged teeth or replace missing ones.

Restorative dental materials

to restore

طب الأسنان الترميمية

Materials used in Restorative Dentistry

- Restorative dental materials are the foundation for the replacement of tooth structure.

- **Amalgam alloys**, **resin composites**, **glass ionomers**, **ceramics**, **cements**, **primers**, **bonding agents**, **noble and base metals**,

حشوات الفضة

حشوات تجميلية

حشوات زجاجية

تستخدم في تركيبات الجسور

تثبيت الجسور

تعزل الحشوة عن منطقة العصب
عشان تقلل من الحساسية

تستخدم في الحشوات التجميلية

كانت تستعمل في الحشوات التي تتكون من ذهب

- Can be classified to:

1. **Direct restorations** are generally placed directly onto tooth structure and do not require laboratory preparation.
2. **Indirect**: formed indirectly over a cast or moth model in the lab by a technician

Amalgam

- Dental amalgam is a restorative material that has been used in dentistry for many years.
- Mercury alloys mixed with other metals
- The main ingredients of amalgam alloy are silver (Ag), tin (Sn), copper (Cu) and **mercury (Hg)**. Small amounts of zinc (Zn) and palladium.

الزئبق

كيف يعمل صاى الة :

- Easy to handle, durable and cheap material
- Used in posterior teeth
- Its use has become questionable!!!!!!!

Can not be used in anterior teeth

خطيرة لانها بتاثر على الدم و الدماغ
بعض الدراسات حكى انه المهم ما يزيد عددهم عن ٣
و في دراسات حكى انه المهم يكون وجودها ثابت وما يتحرك فما
* ما زالت تستخدم في الاردن * رح تاثر

amalgamator بكونو هدول على شكل alloy (سبائك) بحطوهم بجهاز اسمو amalgamator
بعملهم shake و بدمجهم مع بعض بصيرو علو شكل كبسولات عشان يعبو
الفراغات تبعون الاسنان



Review | [Open access](#) | [Published: 13 January 2011](#)

Is dental amalgam safe for humans? Mercury : the scientific committee of the European

[Toxicol Int.](#) 2012 May-Aug; 19(2): 81–88.
doi: [10.4103/0971-6580.97191](#)

The Dental Amalgam

Review > Neurotoxicology
Epub 2020 Oct 14.

Mercury in dental amalgam: a risk analysis

Review > Neurotoxicology
Epub 2020 Oct 14.

of dental amalgam and alternative dental on materials for patients and users

81:382–386. doi: [10.1016/j.neuro.2020.09.034](#).

ity
col. 2016 Aug:79:108–109. doi: [10.1016/j.yrtph.2015.12.015](#). Epub 2016 Jan 18.

Resin composites

A resin composite material is a material made from two or more substances

Aesthetics restorative material for anterior teeth

تستخدم للاسنان الاماميه اذا كان في عندي الحاجه لتجميل او منظر
مرتب للاسنان الاماميه لو صار اي damage

Consist of an organic resin, reinforcing filler and a coupling agent.

Are usually used in conjunction with acid etching, primers and bonding agents. Added as increments (layers)

① حفري
②
③

توحيد

الخطوات :



① Acid etching

② Bonding

③ Light cure

④ Composite filling

⑤ Light cure



سهل لبتحير وتبين الامانة .

Restorative/ preventative

Glass ionomer

bond to the tooth structure
يعتبر حشوة مثالية للاطفال لانو بعمل
structure



- Was introduced in 1972. it sets by an acid-base reaction between polymers of polyacrylic acid and fluoro-aluminosilicate bases. fluoride reaction ال نواتج

- **Advantages:** fluoride release and its unique ability to bond chemically to tooth structure, can be added in bulk.
بنعمل سريعا ما بدى خطوات زي ال
resin

- **Resin-modified Glass-ionomer:** a glass ionomer with resin composite properties. It contains a resin (like a resin composite) that allows it to be set with a curing light (this is opposite to a **compomer** which is a resin composite with glass ionomer properties)

من مطلوبه هذا

Part of dental prosthetics

Ceramics

- **Definition** :Materials that are part of systems designed with the purpose of producing dental prostheses that in turn are used to **replace missing or damaged dental structures (crowns and bridges)**

تعويض للجزء المفقود عن طريق جسر

- Ceramics can simulate the **visual character** of the **tooth substance** successfully and are **biocompatible materials**.

عندها القابليه انها تنكسر من الخارج ، لتفادي هاي
المشكلة خلو الجزء الداخلي منها metal

- **Porcelain-fused-to-metal (PFM) restoration**
- **All-ceramic crowns (aesthetics)**



تجميلية عشان ما يكون في الوان حول خط اللثة



مؤقتة ويتم ازالتها بين الجلسات

Temporary (provisional) restorative materials

- Temporary dental cement such as **zinc oxide eugenol cement**, temporary crown and bridge polymers.

به حن منها
زيت القرنفل

- The traditional odor of dental clinics in the past is due to the use of eugenol or oil of cloves and eugenol containing dental materials such as Zinc oxide eugenol cement.

- **Intermediate restorative materials IRM**

Can last more than one month / one year



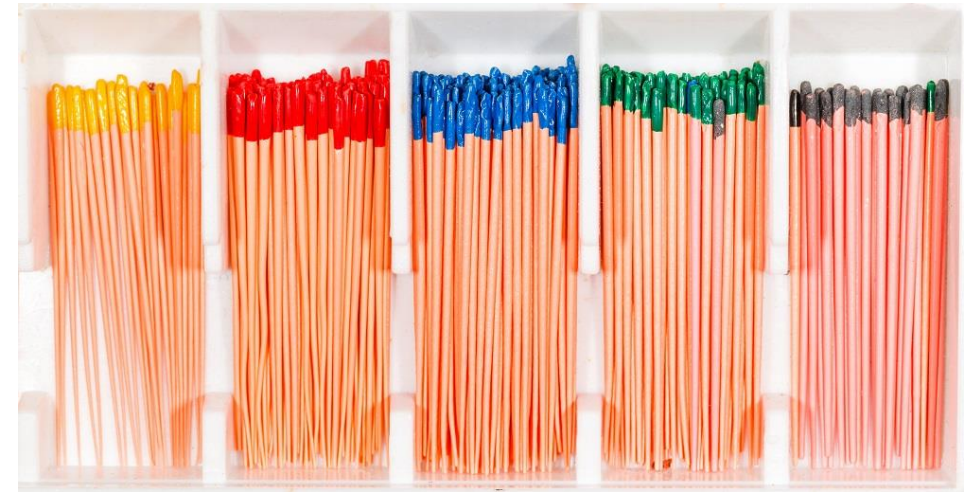
علم معالجة العصب

Endodontic Materials Used To Fill Root Canals

تكون لها احجام مختلفة حسب حجم القناة

- **Gutta-Percha:** Materials used to “obturate” canals after endodontic treatment

سد / ملء



- **Sealers:** binding agents used to adapt the rigid gutta percha to canal walls and fill up the voids

Auxiliary dental materials

بستخدموها عشان يعملو الاستعاضات
السنية

- Materials used in the process of fabricating dental prosthesis.
These include:

1. Impression materials لاخذ الطبقات السنية

2. Dental waxes شمع لتسجيل العضة و الطبقات السنية

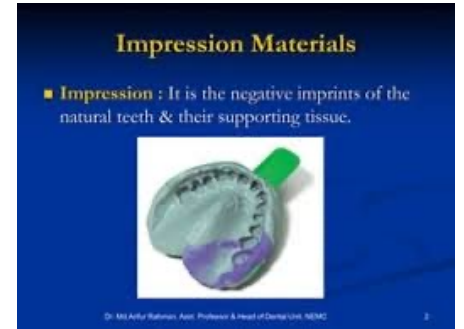
3. Gypsum casts جبصين عشان اصب الطبقات و تعطيني القالب

4. Finishing and polishing abrasives بنعمل تنعيم للاطراف

5. Acrylic resins الجزء الزهري بطقم الاسنان الي يكون من
لون اللثة



1



2



3



Impression materials

- **Impressions** are used in the dental clinics to produce accurate negative reproductions of the patients' teeth, surrounding tissues and dental arches.
- **Casts** (positive reproductions) are created from dental impressions and are used to fabricate various dental prostheses.
- **Impression trays** are used to hold the impression material, allowing the operator to place it into the patients' mouth.



Dental waxes

لازم يكون biocompatible

- Waxes have a variety of uses within dentistry and are manufactured from various materials, including plants, minerals, animals and synthetic waxes.
- They are thermoplastic materials that present as solids at room temperature; they can be softened with heat and hardened with cooling.



Gypsum casts

Positive record

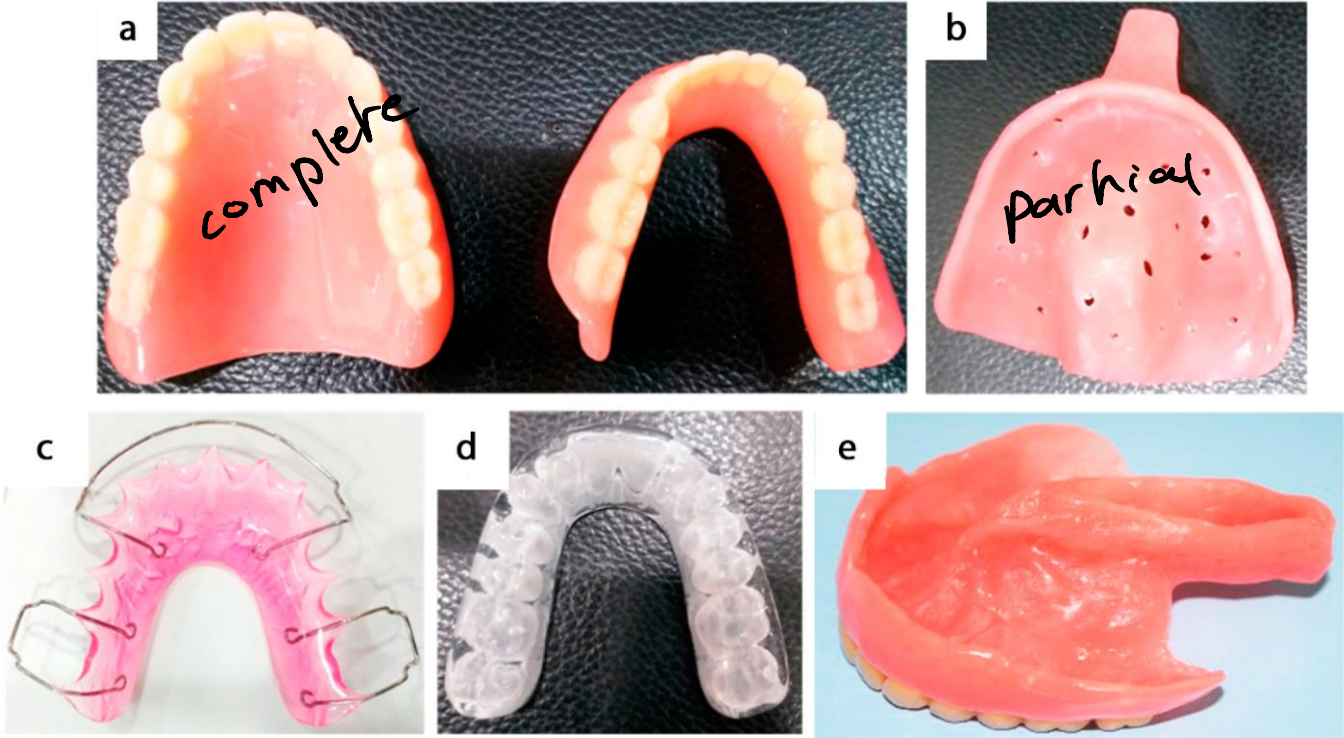
- Gypsum (calcium sulphate dihydrate) is a naturally occurring mineral used in dentistry to fabricate models
- Many dental appliances and restorations are constructed **extra-orally** using models, dies (one tooth) and casts (replicas of the patients tooth/teeth and surrounding tissues).



Acrylic resins

تدخل في كل الاطقمة تبعت
الاسنان

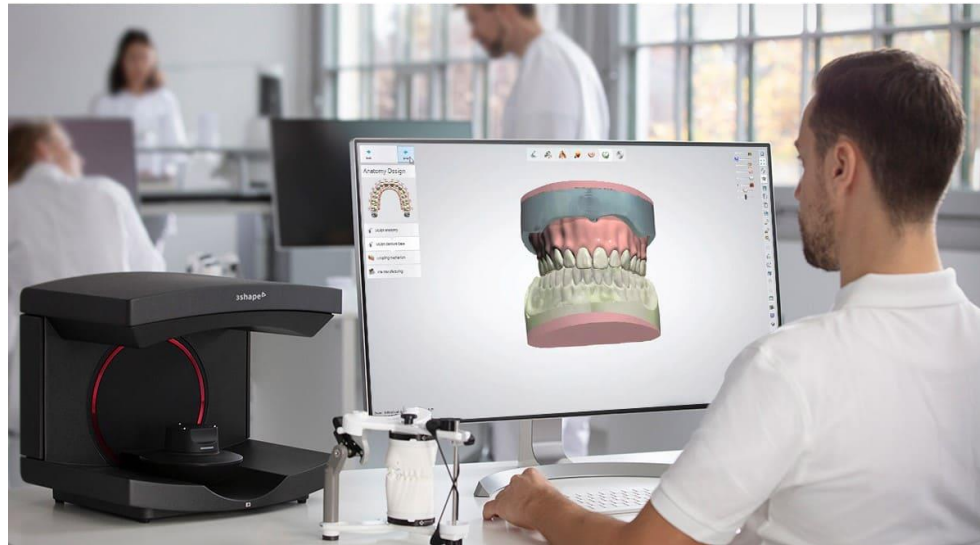
Applications of Denture Base Materials



CAD/CAM

طريقة بديلة باستخدام الكمبيوتر لتصنيع الطبقات و يتم تصنيعها بنفس اليوم بدل عن الطريقة التقليديه

- Computer-aided design/computer-aided manufacturing (CAD/CAM) techniques
- Due to CAD/CAM technology, patients occasionally get restorations on the same day



References

Chapter 1 - Role and Significance of Restorative Dental Materials, Editor(s): Ronald Sakaguchi, Jack Ferracane, John Powers, Craig's Restorative Dental Materials (Fourteenth Edition), Elsevier, 2019, Pages 1-3, ISBN 9780323478212, <https://doi.org/10.1016/B978-0-323-47821-2.00001-9>.

Sirivichayakul, P., Jirarattanasopha, V., Phonghanyudh, A. et al. The effectiveness of topical fluoride agents on preventing development of approximal caries in primary teeth: a randomized clinical trial. BMC Oral Health 23, 349 (2023). <https://doi.org/10.1186/s12903-023-03045-4>

Sreedevi, A., Brizuela, M., & Mohamed, S. (2022). Pit and Fissure Sealants. In StatPearls. StatPearls Publishing.

Berzins DW, Abey S, Costache MC, Wilkie CA, Roberts HW. Resin-modified glass-ionomer setting reaction competition. J Dent Res. 2010 Jan;89(1):82-6. doi: 10.1177/0022034509355919. PMID: 19966038; PMCID: PMC3318046.

Scheller-Sheridan, Carmen. Basic Guide to Dental Materials, John Wiley & Sons, Incorporated, 2010. ProQuest Ebook Central, <http://ebookcentral.proquest.com/lib/cardiff/detail.action?docID=1187860>.
Created from cardiff on 2024-03-18 04:17:25.