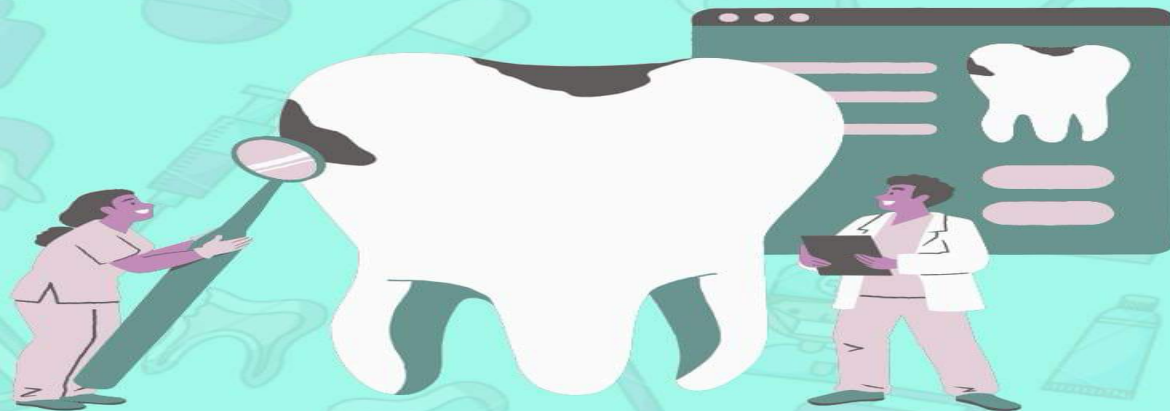




INTRODUCTION TO DENTISTRY



LEC NO. : 4
DONE BY : Nour Al-amoush.

وَقُلْ رَبِّ زِدْنِي عِلْمًا

Introduction to Dentistry

lecture 4: Materials used in Dentistry

By Heba Ali (DDS, MSc, PhD)

Dental materials

- It is the study of **composition** and **properties** of materials used in dentistry and the way they interact with the oral environment.
↑ Physical, chemical, biological → Oral cavity
- The oral cavity is considered to be the **harshest** environment for a material in the body (temperature, ph, saliva, plaque, forces...)
← Challenging) And the presence of bacteria & occlusal forces
- 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.

History of dental materials

In ancient Egypt they used
Prosthodontics (الاستعاضات السنية)

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



فاقد لاسنانه الامامية

Restoration of the dentition with the patient's teeth using gold wire
سلك من الذهب
ancient Egypt around 2500 bc



Denture (طقم اسنان)

Characteristics of dental materials

• It should be:

1. **Biocompatible** (non-toxic, non-irritating, non-allergic) **Can be used on humans**
2. **Mechanically stable and durable** (strong, resistant to fracture) **مقاومة للكسر خصوصاً بعد اول استعمال**
3. **Resistant to corrosion** (does not deteriorate overtime) **غير قابلة للتآكل**
4. **Dimensionally stable** (little or no change to temperature and solvents) **No change in**
5. **Aesthetic** (looks like normal oral tissue) **جمالية خصوصاً لو تم استعمالها بالanterior teeth**
6. **Minimal conduction** (insulates against thermal/ electrical change) **غير موصلة للحرارة او للكهرباء**
7. **Easy to manipulate**

Classification of Dental materials

• Dental materials can be classified as:

1. Preventive dental materials

2. Restorative dental materials

- Direct
- Indirect

3. Auxiliary dental materials

accessories أو مساعدات

The classification of dental materials is not very straight forward!

بمعنى ممكن dental materials يصير لهم overlap
ممكن تكون preventive يعملوا عليها تعديلات تصير
restorative

Preventive dental materials

- Aim: to prevent or inhibit the progression of tooth decay
- 1. Pit and fissure sealants
- 2. Fluoride treatment:
- 3. Mouthwashes and cavity varnishes

حتى تمنع انتشار عملية تسوس الاسنان

Pit and fissure sealants

ما يتكون
smooth
عشان هيكون
تنظيفها

- 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.
- The use of pit and fissure sealants provides a physical barrier that inhibits microorganisms and food particles accumulation, preventing caries initiation, and arresting caries progression .

شقوق

Pit and fissure sealants



صارت انعم ف



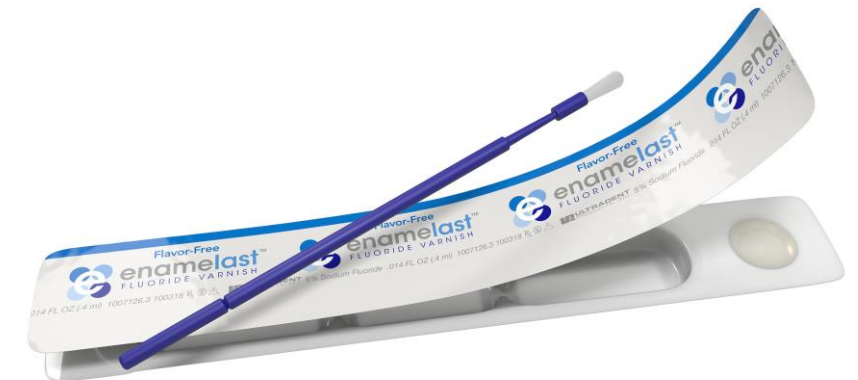
Fluoride treatment

- Professionally applied fluoride therapy to prevent and arrest caries in children and adults.
تركيز الفلورايد في العيادة اكثر من الموجود بمعجون الاسنان
- Early childhood caries remains highly prevalent in many countries.
- Routine tooth brushing is inadequate in cleaning
- The mechanism of action of fluoride is the inhibition of demineralization and enhancement of remineralization
① Removing of minerals
② Adding minerals to hard tissue
- Sodium fluoride (NaF) 5% varnish is a professional topical fluoride

الفلورايد يعزز عملية remineralisation



تقريبا بتضل على السن مدة من 10-5 دقائق



Restorative dental materials

To restore

تستعيد

Materials used in Restorative Dentistry استعادة الوظيفة و الجمالية للاسنان

- 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 زجاجية تستعمل في تركيبات الجسور تثبيت الجسور
حشوات تجميلية حشوات الفضة تستعمل مع الحشوات التجميلية
كانت تستعمل سابقاً في حشوات من الذهب تعزل الحشوات عن منطقة العصب حتى تقلل الحساسية
- 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

حشوات الفضة

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 مع مواد
اخرى

تكون على شكل كبسولات بنحطوا بجهاز اسمه amalgameter بخلطهم بسرعة كبيرة و يتكون كرة داخل الكبسولة و بتنحط بcavity للسن

- Easy to handle, durable and cheap material
- Used in posterior teeth **مهم**
Can't be used in anterior teeth
- Its use has become questionable!!!!!!!

لانه الزئبق سام وجودوا انه موجود ب الدماغ و بالدم
بعض الدراسات حكيت انه المهم ما يزيد عدد هم عن 3
و في دراسة حكيت انه طول ما هي موجودة و ثابتة ما
تحركت ما رح تأثر
ما زالت تستعمل في الاردن لحد الان



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

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

Review > Neurotoxicology
Epub 2020 Oct 14.

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 damage بسبب الحاجة للتجميل و المنظر اللبق للاسنان الامامية لو صار اي

حجم filler يختلف حسب السن

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)



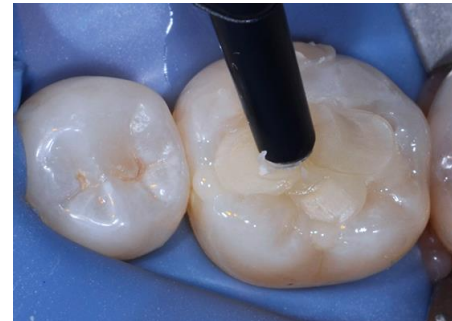
Acid etching
اللون الازرق



Bonding



ضوء مركز يجمد المادة
Light cure



Composite filling



Light cure

They are added layer by layer

Glass ionomer Restorative or preventative

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

من نواتج هاد reaction بصير انتاج للفلورايد

- **Advantages:** fluoride release and its unique ability to bond chemically to tooth structure, can be added in bulk.

ما بنحتاج الsteps يلي كانت موجودة ب 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 **compo**mer which is a resin composite with glass ionomer properties

مش مطلوبة نعرفها هلا



بطريقة معينة بعمل bond to the tooth structure
لهيك هو الحشوة المثالية للاطفال

Ceramics Part of dental prosthetics

- **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)**

يتم فيها تعويض الجزء المفقود من الاسنان عن طريق الجسر

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

معرضة للكسر من الخارج لحتى تتعوض هاي المشكلة خلوا الجزء الداخلي منها metal

- Porcelain-fused-to-metal (PFM) restoration حتى ما ينكسر

- All-ceramic crowns (aesthetics) جمالية عشان ما يكون في الوان حول خط اللثة



Temporary (provisional) restorative materials

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



Endodontic Materials Used To Fill Root Canals

- **Gutta-Percha:** Materials used to “obturate” canals after endodontic treatment
لاغلاق القنوات بعد المعالجة و
عبارة عن filler و احجام مختلفة
حسب حجم القنوات
- **Sealers:** binding agents used to adapt the rigid gutta percha to canal walls and fill up the voids



Auxiliary dental materials

تستعمل لعمل الاستعاضات السنية

- Materials used in the process of fabricating dental prosthesis.

These include:

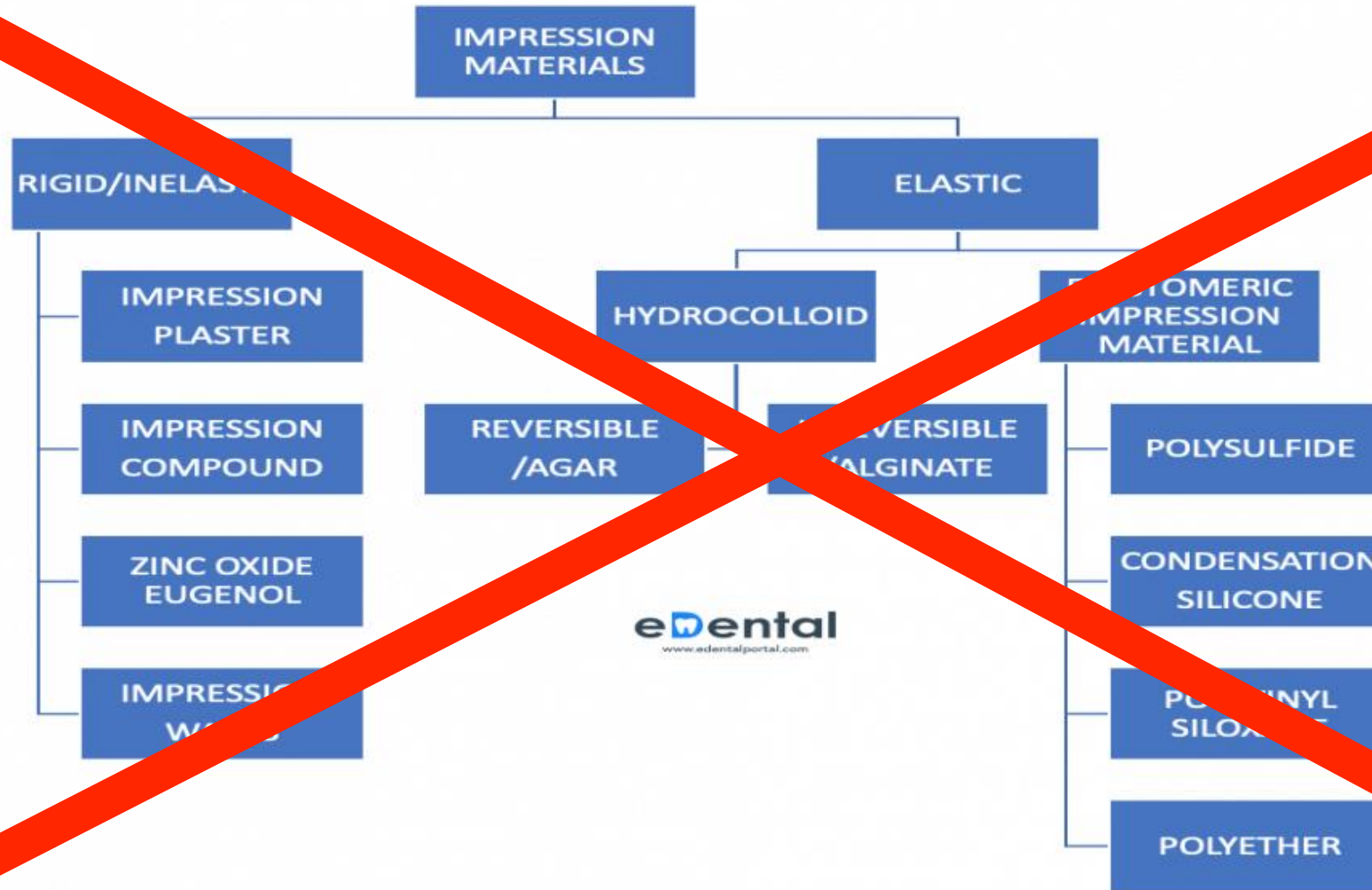
1. Impression materials لأخذ الطبعات السنية
2. Dental waxes شمع لتسجيل العضة و الطبعات السنية
3. Gypsum casts جبصين لصبّ الطبعات عشان تعطينا القالب
4. Finishing and polishing abrasives بنعمل تنعيم للاطراف
5. Acrylic resins الجزء الزهري من طقم الاسنان يلي يكون من لون اللثة

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. هو يلي بوضوح أسنان المريض
- **Impression trays** are used to hold the impression material, allowing the operator to place it into the patients' mouth.

بتكون بانواع و اشكال متعددة و احجام مختلفة
لحتى تتناسب مع المريض و عمره





Dental waxes لازم يكون biocompatible

بنستخدمها لتسجيل عضة المريض

- 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

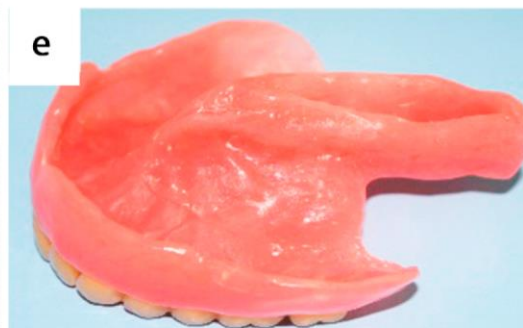
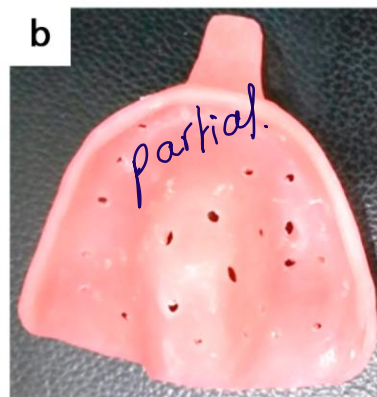
- Gypsum (calcium sulphate dihydrate) is a naturally occurring mineral used in dentistry to fabricate models
- Many dental appliances and restorations are constructed **extra-orally** using models, dies (one tooth) and casts (replicas of the patients tooth/teeth and surrounding tissues).



Acrylic resins

تدخل في الاطعم الكاملة

Applications of Denture Base Materials



CAD/CAM

ممکن الاطباء يستغنون عن الطبقات بالطريقة التقليدية
و التصنيع لالهم برضو يكون بواسطة الكمبيوتر و عادةً يكون بنفس اليوم

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

