

Introduction to Dentistry

lecture 4: Materials used in Dentistry

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Dental materials

- It is the study of **composition** and **properties** of materials used in dentistry and the way they interact with the oral environment.
- The oral cavity is considered to be the ^{بيئة صعبة}harsh^{est} environment for a material in the body (temperature, ph, saliva, plaque, 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

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

إحدى الحالات قديماً



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



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Denture

طقم أسنان

خصائص

Characteristics of dental materials

• It should be:

ما يتحسس غير مزعجة

1. **Biocompatible** (non-toxic, non-irritating, non-allergic)

2. **Mechanically stable and durable** (strong, resistant to fracture)

ماتعرض للتلف

3. **Resistant to corrosion** (does not deteriorate overtime)

ما يتصغر أو يتكبر

4. **Dimensionally stable** (little or no change to temperature and solvents)

جمالية

5. **Aesthetic** (looks like normal oral tissue)

6. **Minimal conduction** (insulates against thermal/ electrical change)

غير موصلة

7. **Easy to manipulate**

سهولة للطبيب

Classification of Dental materials

- Dental materials can be classified as:

There are 3 types of dental materials :

1. Preventive dental materials

مواد ترميميه لطب الأسنان

2. Restorative dental materials

- Direct

- Indirect → مختبرات و فنيين

3. Auxiliary dental materials

مواد طب أسنان مساعده

توقف حدوث الخرف

The classification of dental materials is not very straight forward!

1. Preventive dental materials

تسوس الأسنان

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

Examples : حفر وشقوق

- ① Pit and fissure sealants
- ② Fluoride treatment:
- ③ Mouthwashes and cavity varnishes

the explain is
below

Pit and fissure sealants

هي زي عمليه عشان نسكر الشقوق والتجاويف
لأسباب منها تسهيل تنظيف الأسنان ومنع تسوس
الأسنان الخلفيه

زي تعبئة للشقوق

Pit and fissure sealants

- 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.

→ Posterior teeth

- 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.

منع تطور التسوس



Fluoride treatment

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

Aim ↗

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

تركيبة عالي



يُعمل على دعم سطح السن
ويجعله مقاوم



Restorative dental materials

Materials used in Restorative Dentistry

- Restorative dental materials are the foundation for the replacement of tooth structure.
الاستعاضة المنيّة
- Amalgam alloys**, **resin composites**, **glass ionomers**, **ceramics**, **cements**, primers, bonding agents, noble and base metals,.
حشوات الفضة حشوات تجميلية حشوات زجاجية منفا شغل بورسلان و جسر لتثبيت الجسور

- Can be classified to:

- Direct restorations** are generally placed directly onto tooth structure and do not require laboratory preparation.
- 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.
- Easy to handle, ^{تدوم} durable and cheap material
- Used in ^{مolars} posterior teeth
- Its use has become questionable!!!!!!



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.

[Neurotoxicology](#). 2020 Dec;81:382–386. doi: [10.1016/j.neuro.2020.09.034](#).

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على اسم المادة المتخذة

Resin composites

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

Aesthetics restorative material for ^{مهم} anterior teeth

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)* → step by step



1. Acid etching



2. Bonding



3. Light cure



4. Composite filling



5. Light cure

↓
لتخشين سطح السن

Glass ionomer

يتم وضعه مره واحده مش
Layer by layer

↳ usually its for pediatric

- Was introduced in 1972. it sets by an acid-base reaction between polymers of polyacrylic acid and fluoro-aluminosilicate bases.
- **Advantages:** fluoride release and its unique ability to bond chemically to tooth structure, can be added in bulk. #
- **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)

مش مطلوب



Ceramics → Easy to break \xrightarrow{So} عملوا الطبقة الداخليه من ال metal

- **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)**



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

- Porcelain-fused-to-metal (PFM) restoration

- All-ceramic crowns (aesthetics)

↳ for anterior teeth



بورسلان سهل الكسر
وضعوا داخله ال metal
to support

Temporary (provisional) restorative materials

* حشوآت مؤقتة

- Temporary dental cement such as ^{Ex:} **zinc oxide eugenol cement**, temporary crown and bridge polymers.
- 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**

له قوتة جمة



Endodontic Materials Used To Fill Root Canals

* معالجة العصب

- **Gutta-Percha:** Materials used to “obturate” canals after endodontic treatment
- **Sealers:** binding agents used to adapt the rigid gutta percha to canal walls and fill up the voids



– بس اعرفوا أسماءهم.

Auxiliary dental materials

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

1. Impression materials طبعة

2. Dental waxes شمع

3. Gypsum casts مادة توضع على جبصين

4. Finishing and polishing abrasives

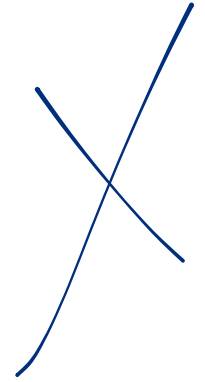
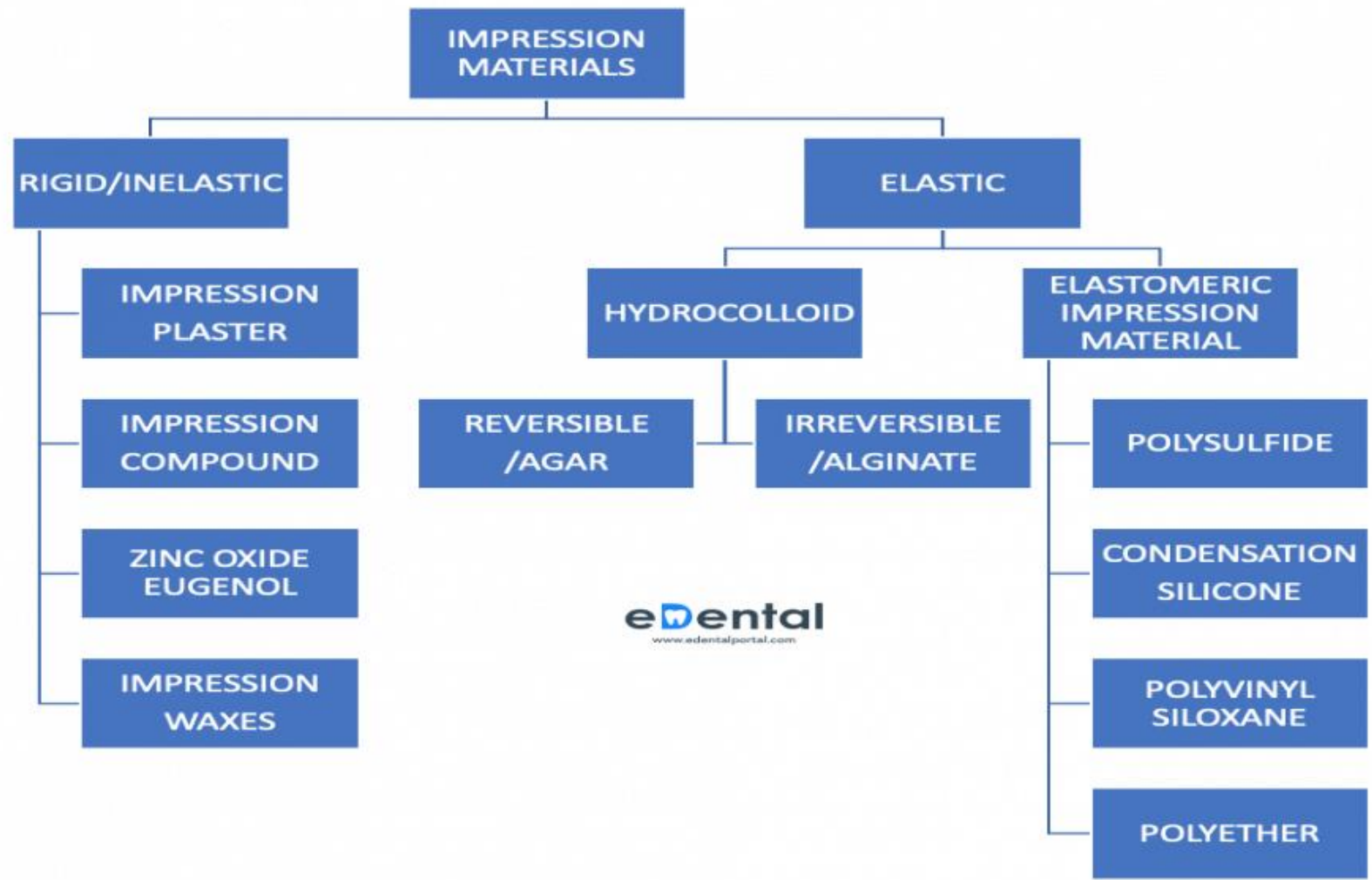
5. Acrylic resins

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.



X نس مطلوب
ياركاترة



Dental waxes

- 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. ↓

تكون صلبه ويتم تدويبيها بالحراره



Gypsum casts

- Gypsum (^{جبس} 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

طعم الأسنان

Applications of Denture Base Materials

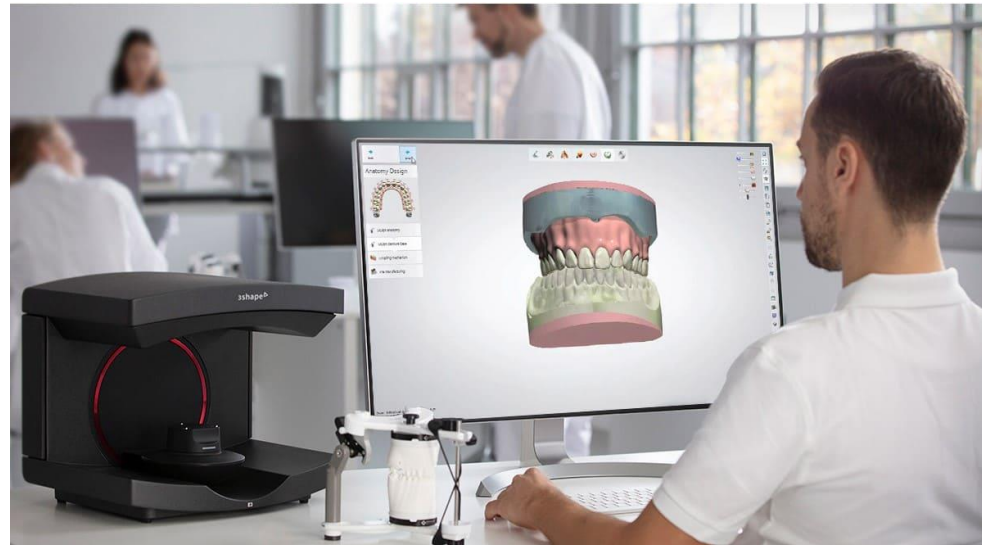


CAD/CAM

حتی نمونہ طبعاتے →

abbreviation

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



References

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