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**Dental oral implantology in prosthodontics**

**Many implant systems**  **have been introduced into the dental market, varying in shapes , materials, and coating ( ceramic , calcium hydroxide..).**

**we’ll go through:**

1. **History , since It is not a recent topic in dentistry.**
2. **Materials**
3. **Different implant systems**
4. **Indications and contraindication.**

**History**

* Researchers traced the beginning of the dental implants to the ancient Egyptian and South American cultures since 18th century .
* **19th** century: dentists used many alloplastic material such as gold, porcelain, ivory and Indian rubber to replace missing teeth
* **Greenfield** 1913 : introduced Endosteal dental implants which consists of 2 pieces of hollow basket that is inserted in the bone made of platinum , and its suprastructure that appears in the mouth.
* **Stock1939** : inserted the first Co/Cr screw shaped implant in freshly extracted socket , Where he noticed that the primary stability is mandatory for any implant system .
* **Formiggini**1947 **:**  introduced a spiral design , but unfortunately it failed .
* **Chercheve**1962*:* introduced the double helical design.
* **Scialom** 1962 : they introduced street of needle design (similar to the street of columns in jerash),they were inserted just on the mucosa , they also failed.
* **Dahl**1943, introduced the subperiosteal dental Implants then they have been modified by Goldberg and Gershkoff in 1949 , this implant system is still existing , made of co/cr , Mainly used in the mandible where the bone is less than 4mm in height , we have to open a flap from retromolar to retromolar exposing the bone , then take the impression and set your design the same as a co/cr , emerging from the gingiva , it just rests on the bone after that reposition the flap back to its place ( so no real osseointegration here , it is just a mechanical resting on the top of alveolar bone )
* **Linkow**1964 : introduced the vent implant made from chrome nickel alloys, used for ridges that are narrow bucco-lingually
* **Roberts and Roberts**1970s***,*** introduced the ramus frame implants like a tripod extending From the symphysis anteriorly back to the ascending ramus of the mandible.
* **Small**1975, introduced the mandibular stable implants ,similar to trans-fixation screws that are used in fractures of the mandible , it's made of alloys and approached **extra orally** from the lower border of the mandible (submental area) to the crest of the alveolar ridge ( it is like a major surgery ) then screwed . it is mechanical , nothing to do with osseointegration .
* **Bosker**1986, introduced the trans-mandibular implant (TMI) system , this is where the mandible is less than 4 mm especially in the posterior area , they are completely made of gold , very expensive and done under general anesthesia .

**\*\***the only two implant systems that can be approached extraorally:

**Small (**mandibular stable implants )**, bosker(**trans-mandibular implant)**.**

* The real story started in 1952 , accidentally professor Branemark (orthopaedic surgeon) and his team discovered the biocompatibility of Titanium in animals and remarked how it had the tendency to fuse with bone. He placed titanium screws in rat femurs and remarked how the screws were tighter than when originally put in. he did the experiments from 1952 until 1965. then He was followed by Schroeder in 1977 .
* in 1969 Branemark described this phenomena and called it "osseointegration”
* there are more than 600 dental implant systems manufactured by different companies. In Jordan there are more than 60 systems .
* **Osseointegration** by definition: is a process of direct structural and functional connection between the Living bone and the surface of the alloplastic material (titanium) which is achieved under functional loading at a **microscopic** level , they called it “functional ankylosis" .
* definition by **Zarb** 1991: A time dependent healing process where by clinically asymptomatic rigid fixation of alloplastic material is achieved and maintained in bone during functional loading; this is the **clinical** definition not at the microscopic level*.*
* linkow and Weisssupported the **Fibrointegration** which is fibrous tissue between the interface surface of the Implant and the bone to mimic the PDL like the natural teeth , so no primary stability will be there. the failure rate was more than 75 % after 5 years.
* Any fibrous tissue between the bone and metal is considered a non-integrated failed implant.
* Implant materials ; Many different implant materials were known : gold, silver, stainless steel, titanium, palladium and in addition to non metallic materials such as Indian rubber, ivory, porcelain, poly methyl methacrylate,Ceramics, carbon, and nowadays zirconium being the latest one .

**Pure titanium**

(99.6%) titanium , (0.4%) a corrosion resistant alloy(nickel)

1. Biocompatible with the living tissues
2. Excellent mechanical properties; **6** times stronger than the cortical bone
3. Histological sections show intimate contact between the implant and bone surfaces.
4. Corrosion resistance ; since it contains Nickel

once the pure titanium is exposed to the biological environment ,an oxide layer forms on its surface ( chemical and physical property ) , this oxide layer is the cause of osseointegration.

there were fears from it being deposited into different organs and tissues (liver, spleen, lymphnodes), eventually it was proved that it is safe and inert material. Also it was found that the daily intake of Titanium ranged from

0.3-1 mg from vegetables and other foods and excreted through the urine , also they found that the biological half life of titanium was about 320 days, preventing it from accumulation in the human body.

**coating materials**

1. titanium plasma spray (TPS), we had to wait for at least 5 months for the maxillary healing, and 3 months for the mandible.
2. sandblasted large grit acid etch , here the healing time reduced to the half, 2.5 months in the maxilla and 1.5 months in the mandible
3. hydroxyapatite, tried in the mid 80s, with the advantage of rapid osseointegration ( less than 3 months ) , high success rate in the first 3 years BUT after 5 years of function it had high failure rates, it showed cracks or even complete loss of coating, also invasion of microorganisms through these cracks down to the bone leading to failure.
4. Bioactive materials, 2 weeks only for mandibular healing , but it is at the expense of price.

**Methods of coating**

* sandblasting
* Acid etch methods ( like composite )
* Laser methods

**Comparison between different materials**

1. Stainless steel, CoCr, gold alloys, and polymethyl methacrylate:

-Type: biotolerant to the tissue

-Histological appearance: fibrous tissue between bone and metal.

-type of osteogenesis: "distant" as there is a distance between bone and the metal (fibrous tissue)

1. Titanium and Ceramics:

-Type: Bioinert; no any reaction with the soft tissues.

-Histological appearance: close intimate contact with bone surface with no gaps.

1. Bioceramics and Hydroxyapetite:

-Type : Bioactive

-Histological appearance: chemical bond, true bond

**Classification of dental implants**

The most widely used classification of dental implants is the one according to the **form** and **Position**:

* Intramucosal implants
* Titanium mucosal inserts
* Subperiosteal implants
* Transosseous dental implants
* Endosseous dental implants, (the one used nowadays).