Dental Implants

DR.Riad G. Altaee
Consultant Maxillofacial Surgeon

Definishing.

Dental Implant

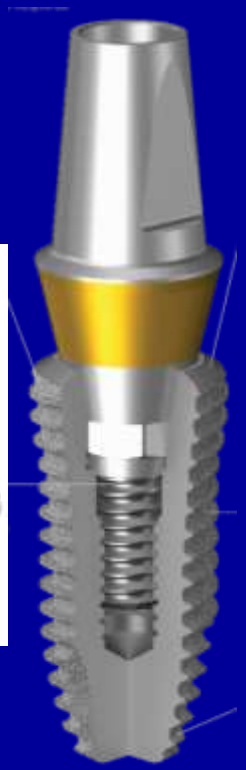
Is a metal device designed to replace missing tooth, made of titanium and it is surgically placed into the bone, apone which a crown is constructed.

Composed of

1-Implant Body(Fixture)
- rough part
- smooth part

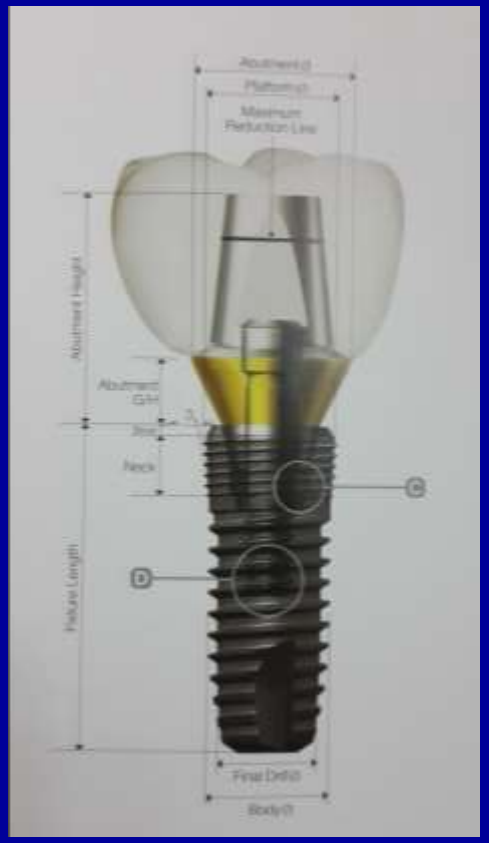
2-Abutment,
- removable abutment
- fixed abutment

3-Implant abutment Connection



Implant Abutment Connection

1-Press fitting, Self-locking connection
Platform switching.
2-screw.

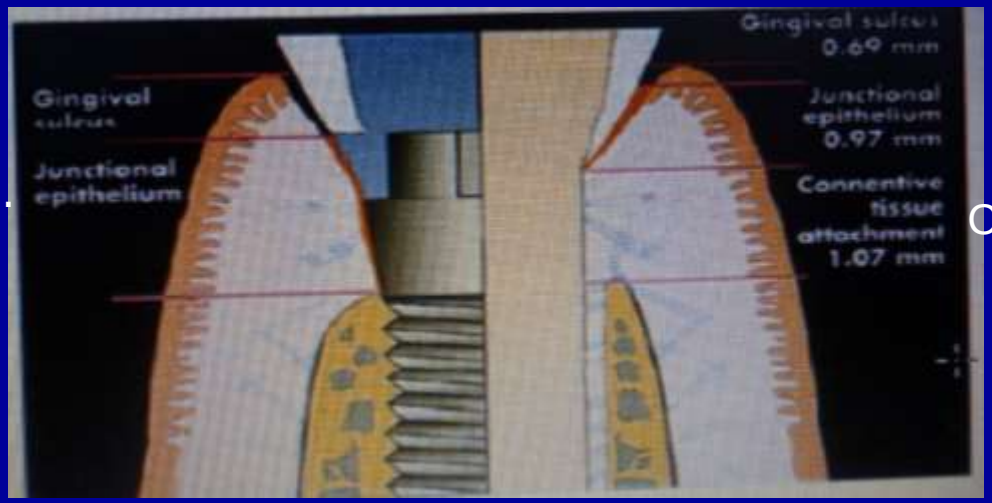


Peri implant Attacment

1-Soft tissue attachments to implant

(Supracrestal attachment)

Junctional Epith.



Gengival Sulcus

Junctional Epithelium

Connective Tissue Attachment

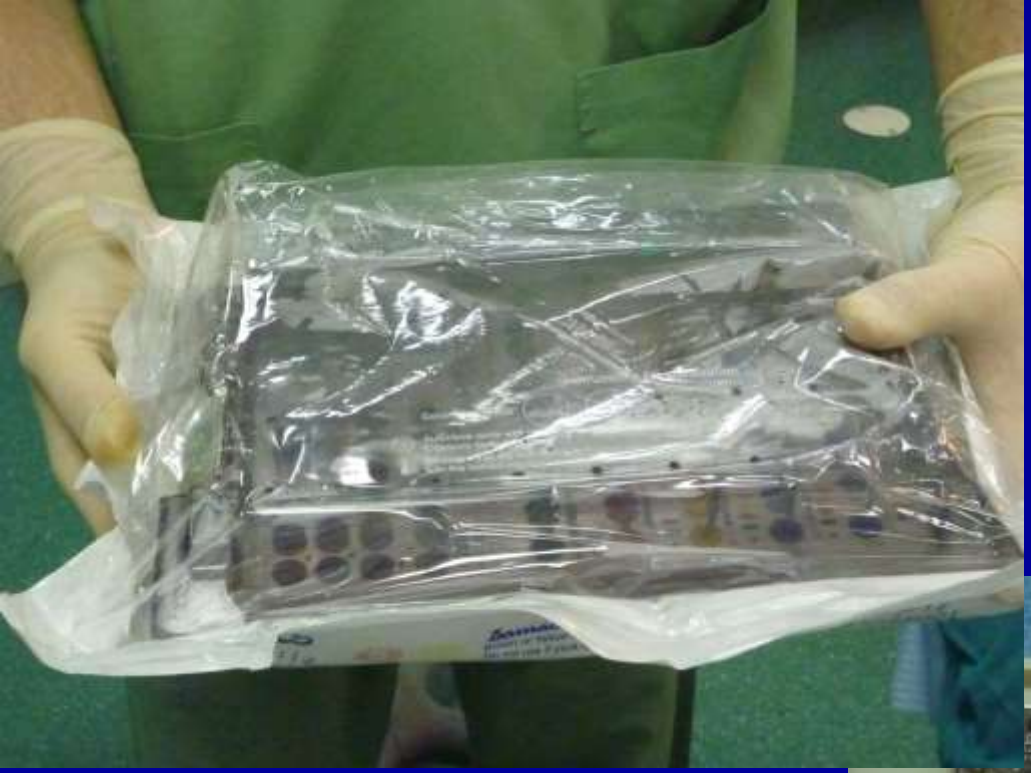
BIOLOGICAL WEDTH

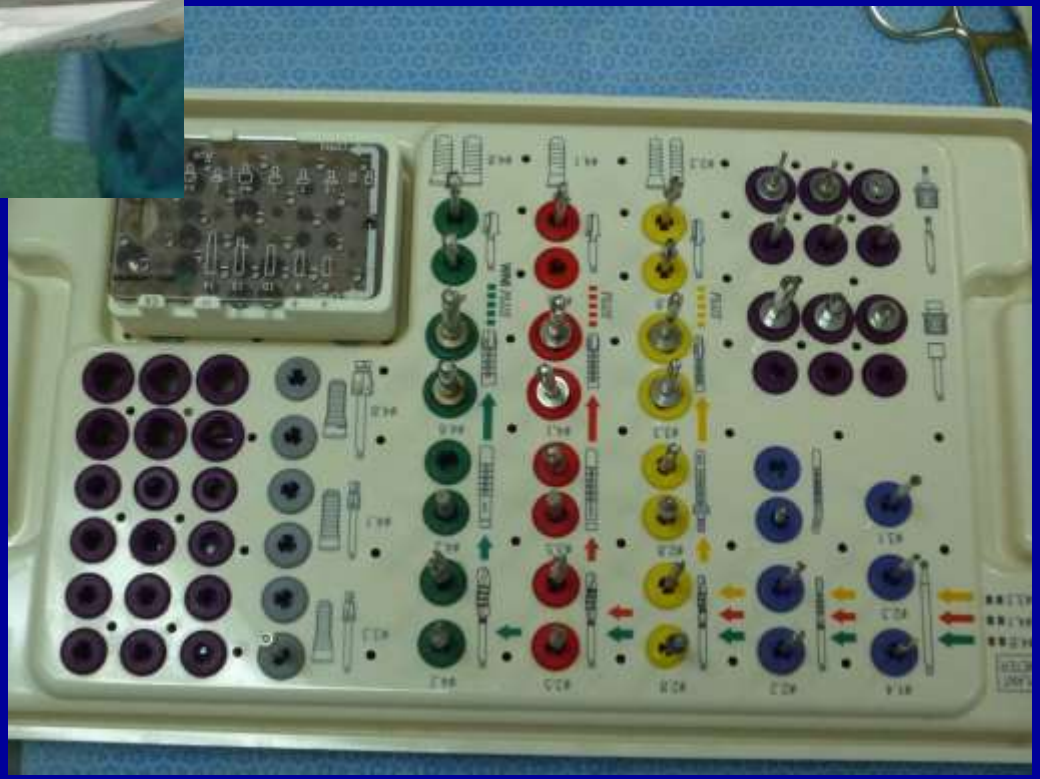
2-Bone attachment to Implant

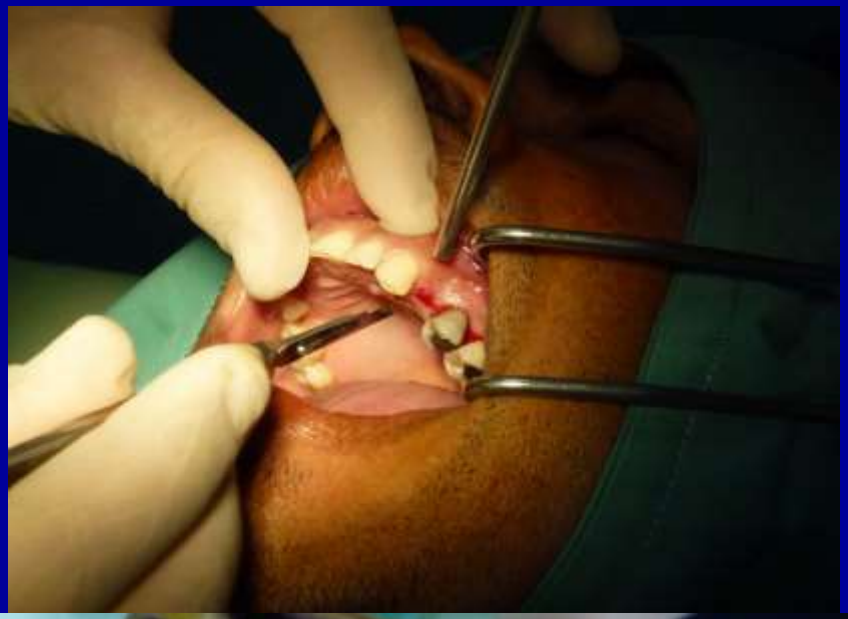
Osseo Integration

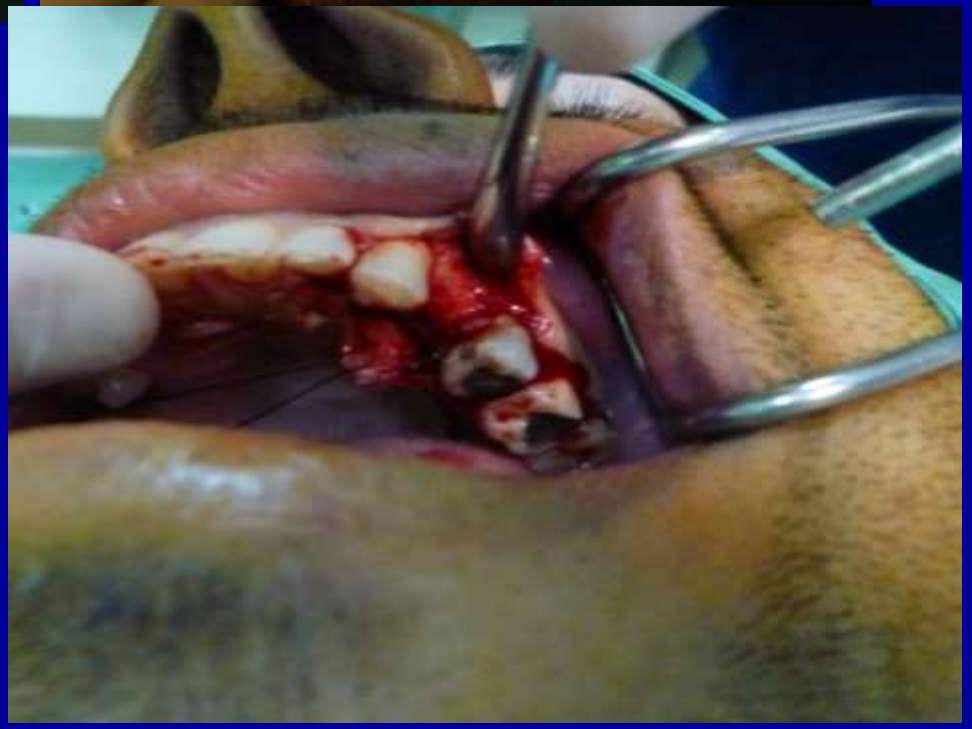
Surgical Part

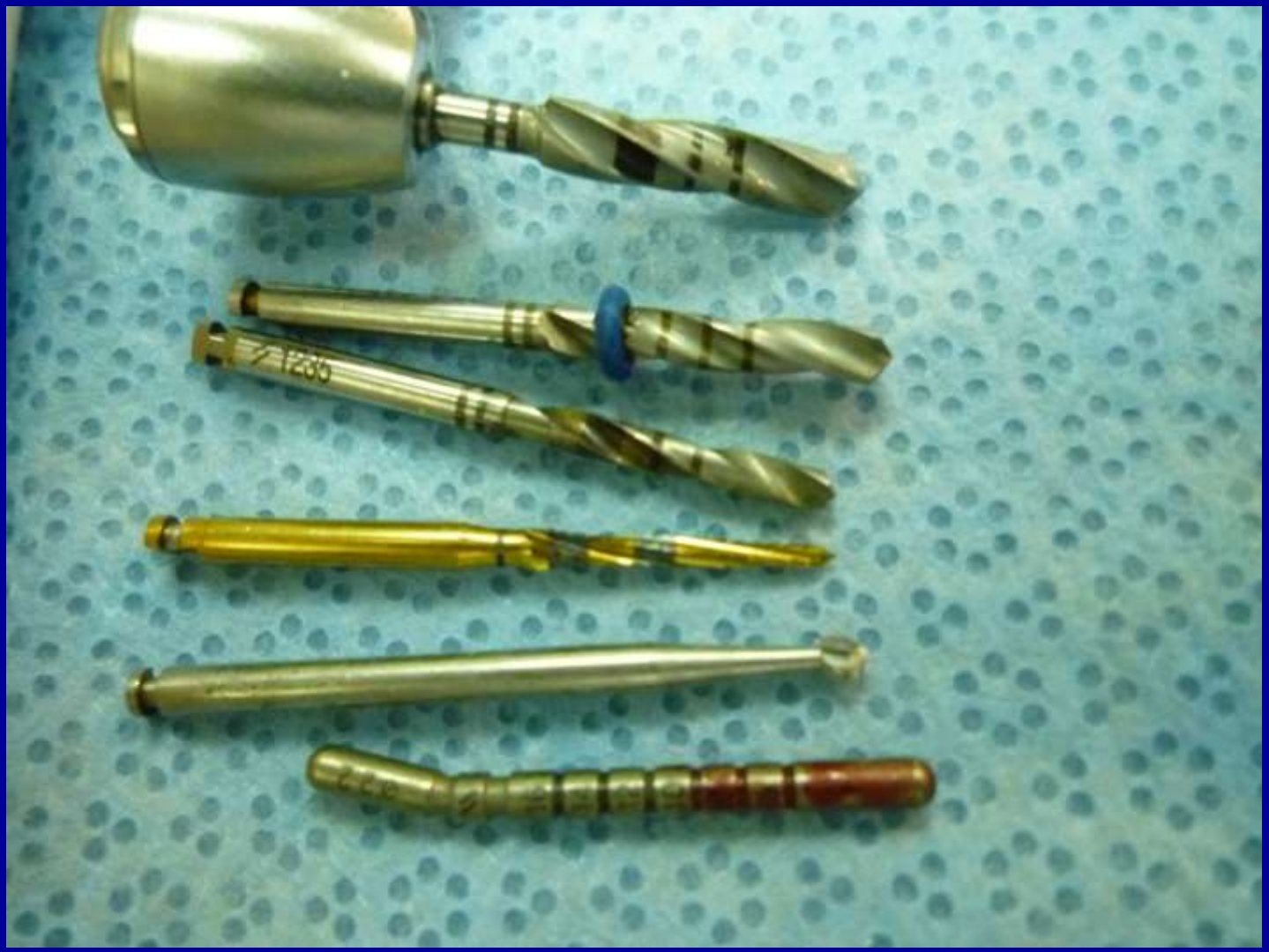
- Infection Control Procedure
- Slow Speed Handpeice
- Water Coolant
- Placing the implant in a 3 dimentional area in the bone according to pre surgical clinical and prosthetic evaluation.

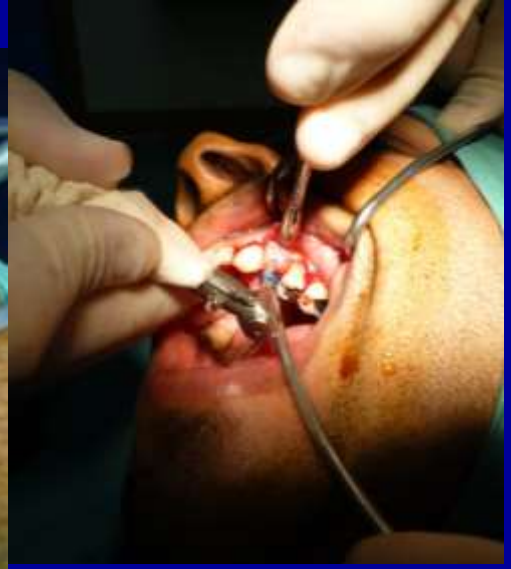
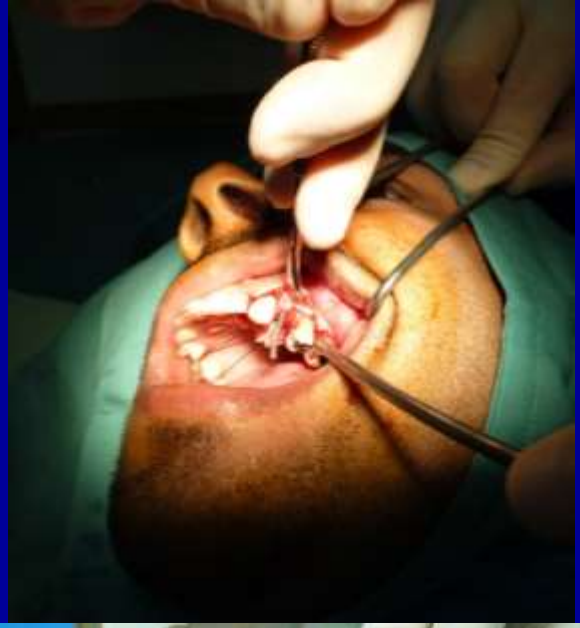
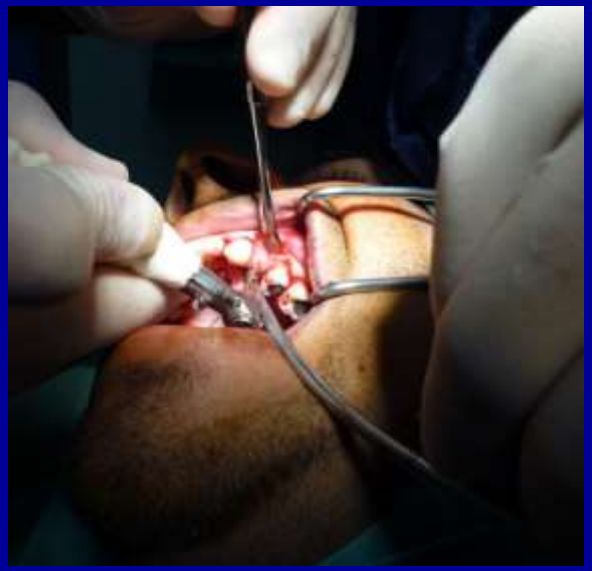
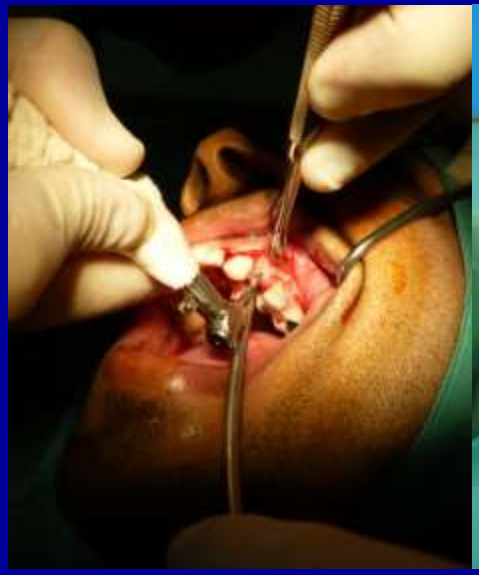
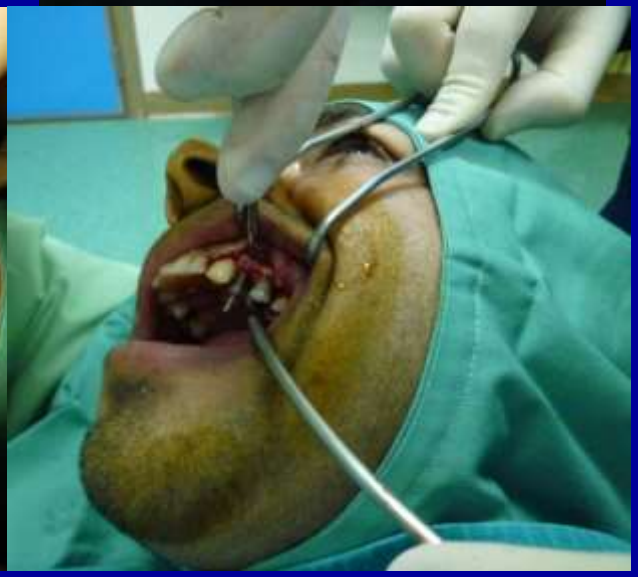




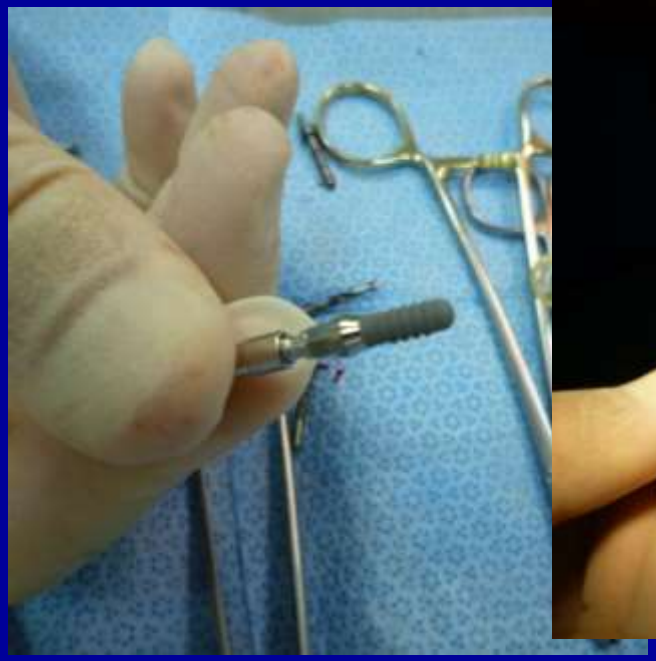


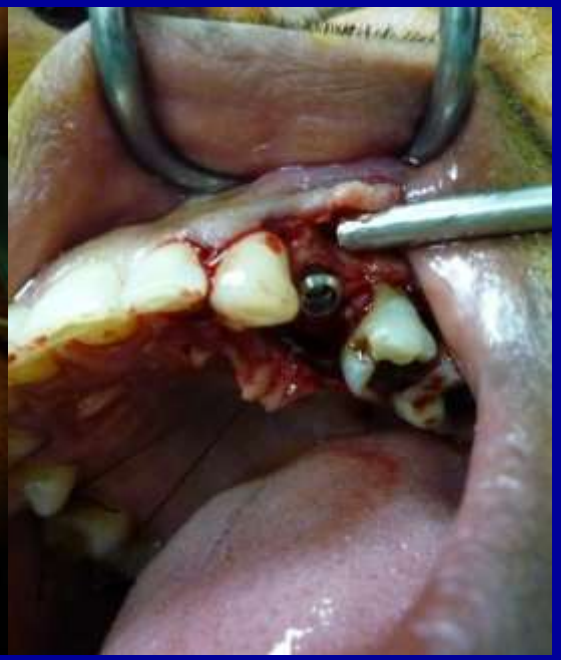


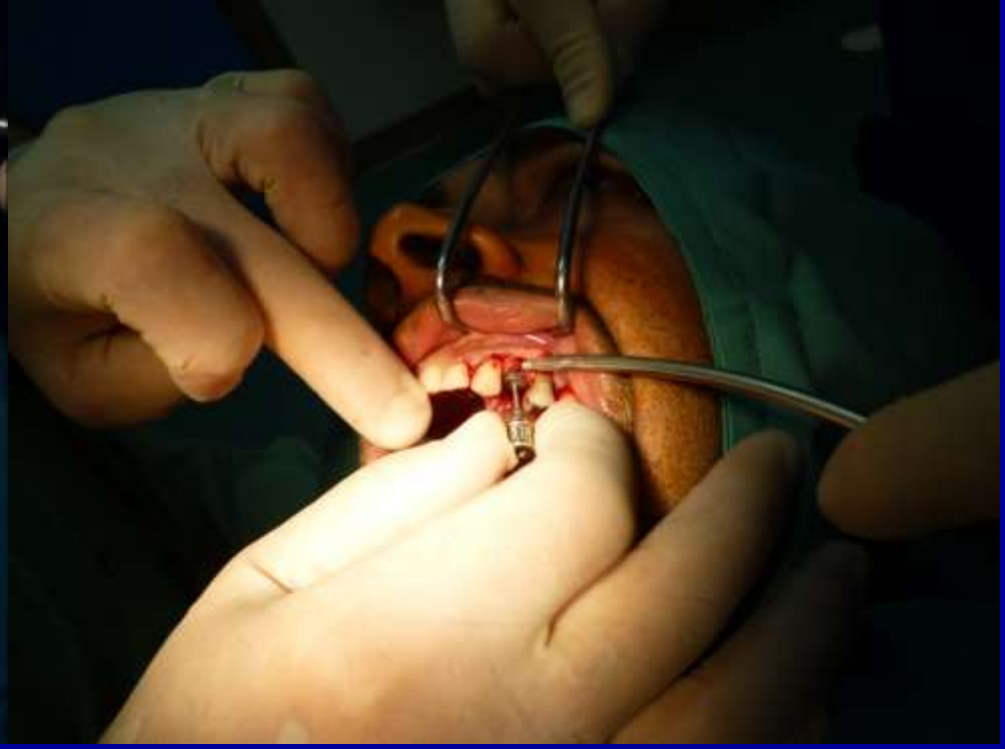
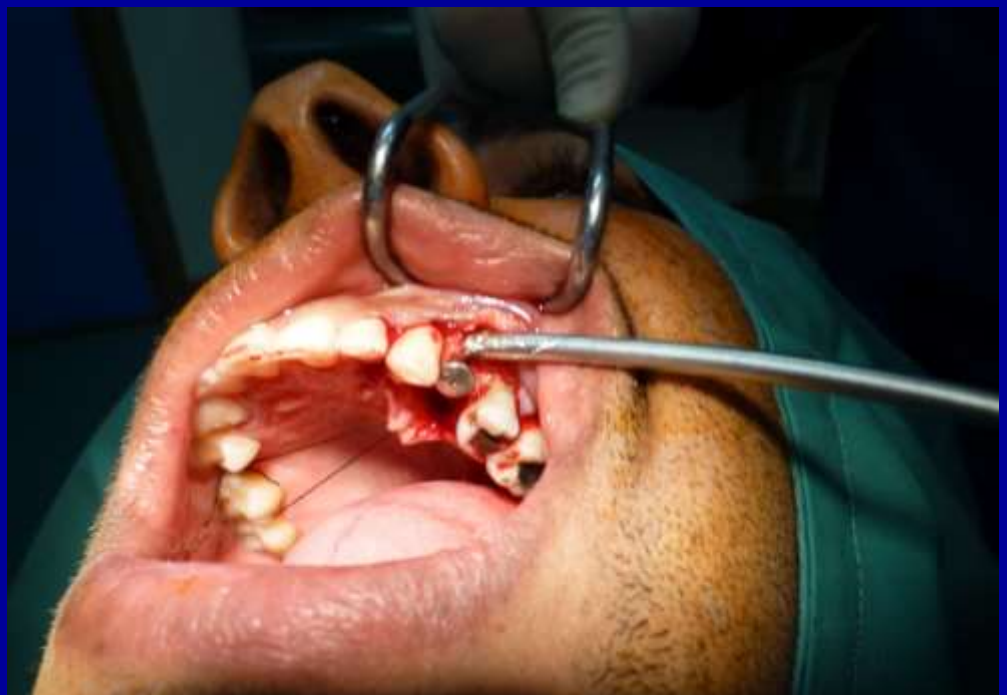
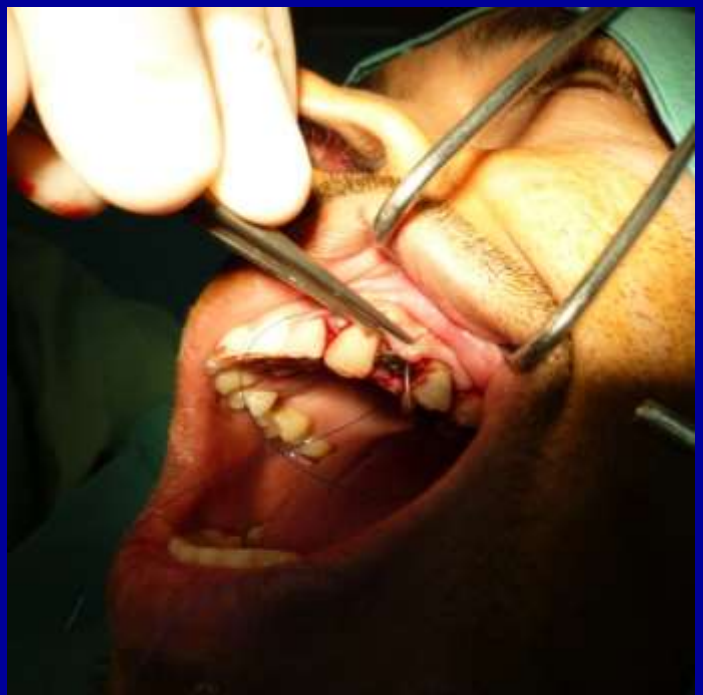


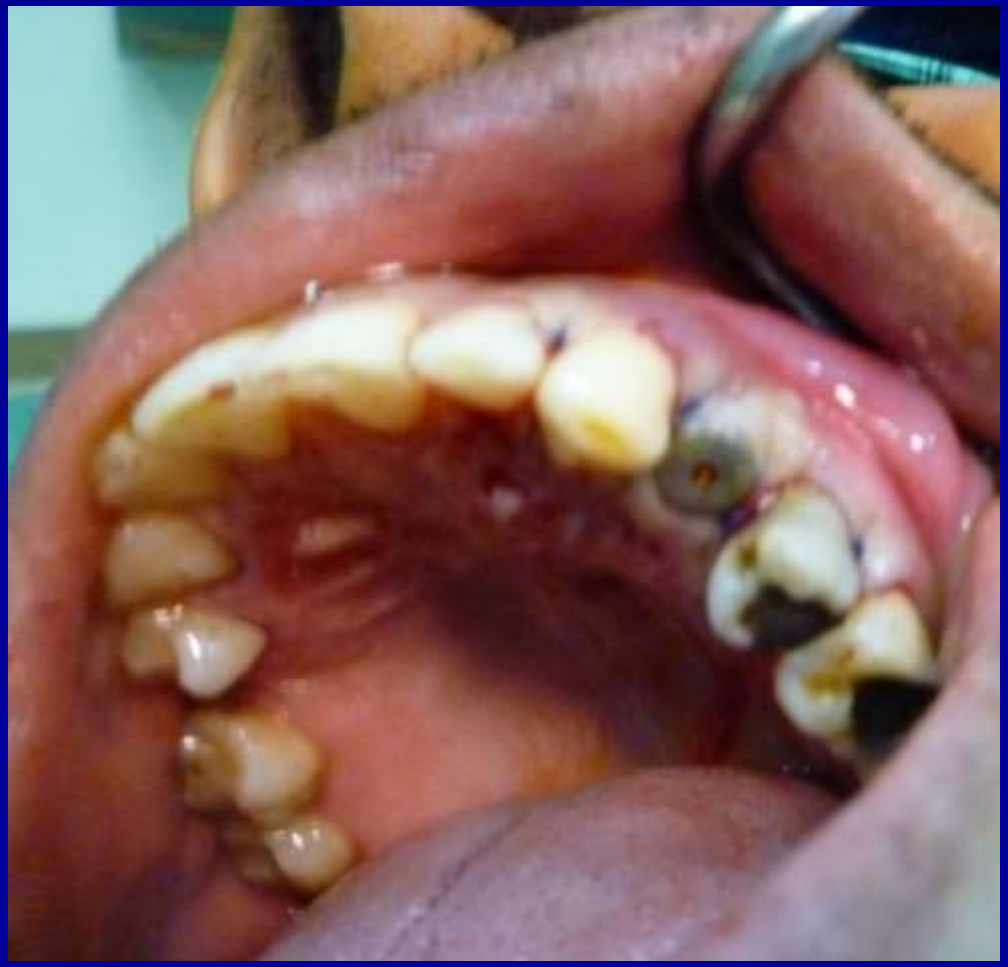













To Discuss.

BONE

Physiology, Healing, Anatomy, amount and type, Relation of bone to Osseo integration.

IMPLANT

Material, surface ,

OSSEOINTEGRATION

Bone to implant connection.

SOFT TISSUE RELATION TO IMPLANTS

Soft tissue attachments (supracrestal).

Kind and Amount of gengiva present.

Lip thickness.

TYPES OF IMPLANTS.

TYPES OF ABUTMENTS.

IMPLANT ABUTTMENT CONNECTION.

EMERGENCE PROFILE.

PROSTHETIC PART.

Bone

Bone is a bloody, dynamic, living tissue, that changes through out life. Bone is able to perform adaptive remodeling under an even distribution of functional loads. This provides a mechanism for a scar-free healing and regeneration of damaged tissue.

Remodeling is achieved through the resorptive activity of osteoclasts and the synthetic activity of osteoblasts.Imbalance between the activities of the two cell type result in

Bone Metabolic Diseases.

Disuse Atrophy.

The mechanical strength of bone is the result of the highly tension proof arrangement of its collagen fibrils impregnated with

Hydroxyapatite crystals.

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القوه الأليه للعضم هي نتيجه الترتيب والتنسيق للألياف الكولاجينيه المقاومه للشد

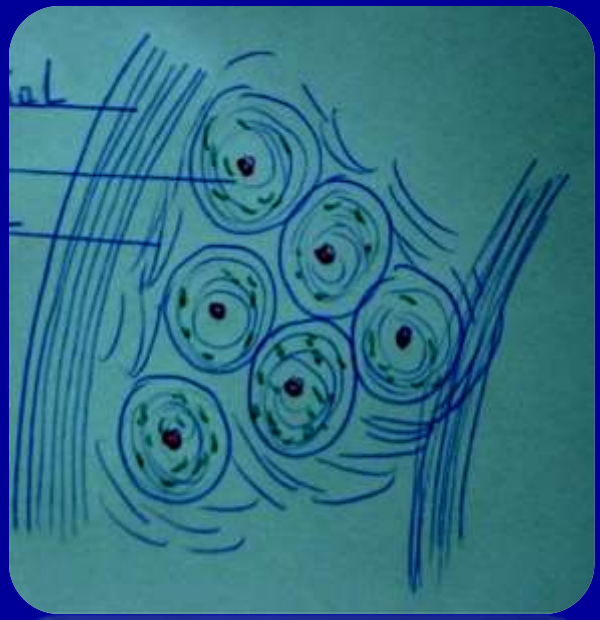
Types of Bone

Bone consist of 3 types of tissue that differ in collagen fibril arrangement and mineral content. This difference depends on Age, Developmental Stage, Localization and Function

1- Woven Bone

- Irregular arrangement of newly developed collagen fibrils
- Formed rapidly,(30-50 micron/day), by progenitor cells in
- the vicinity of blood vessel.
- It is formed during development, growth and healing.
- Richer in cells
- Lower mineral content.
- Rapidly replaced by mature lamellar bone.

Types of Bone



2-Lamellar Bone (compact,and Cancellous),

- Collagen fibrils arranged in layers
- higher mineral content, less rich in cells.
- Forms at a rate of less than one micron/day.
- Consist of microscopic layers or lamellae.

either Circumferential (forms the outer and inner perimeter.

Concentric (make up the bulk of compact bone), forms the basic metabolic unite of bone (OSTEON) or haversian system.

Interstitial which are interspersed between adjacent concentric lamellae and fill spaces in-between them.

3-Bundle or Woven fibered Bone.

Found in the zones of attachments.

Lamellar Bone

CORTICAL BONE

Circumferential .

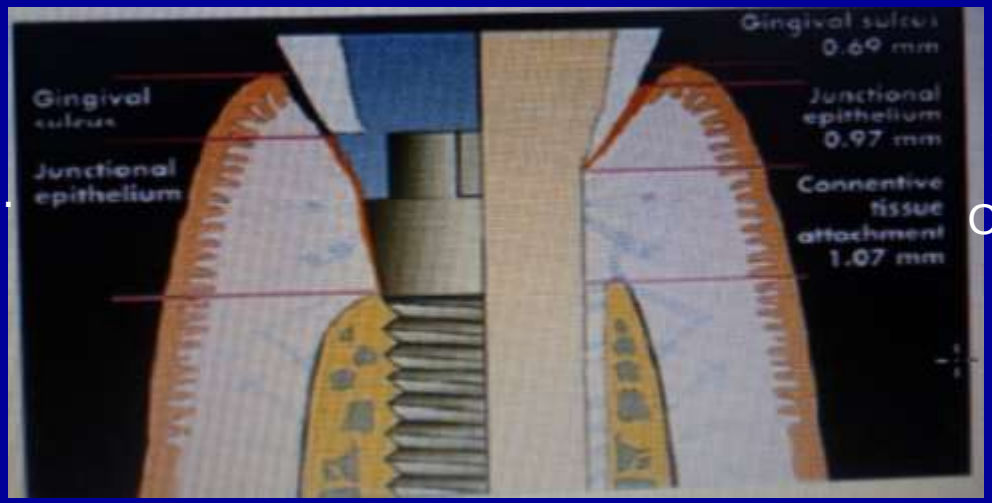
Concentric.
OSTEON

Interstitial

How does this Bone holds and maintains the titanium implant

Peri implant Attacment

1-Soft tissue attachments to implant
(Supra-crestal attachment)



Gengival Sulcus

Junctional Epithelium

Junctional Epith.

Connective Tissue Attachment

2-Bone attachment to Implant
Osseo Integration

Process of Osseo-integration

Nature
Osseo-integration

- This is the bonding between Bone and Implant surface in a micromechanical interdigitation by the cement line.
- Direct Structural and Functional Connection between ordered living bone and the surface of a load bearing implant. متناسق
- The implant material plays a decisive role for the achievement of union.

Cement Line

1875,Von Ebner first reported that new osteons were demarcated from the surrounding bone by a distinct matrix which he called Cement Line, suggesting the biological function of cementing a secondary osteon to the surrounding bone matrix.

This cement line, secreted by differentiated osteoblasts, as a Non Collagenous mineralized matrix, invaginate, interdigitate,and interlock with the demineralized collagenous matrix which is left by the resorbing osteclasts. This connection is in a 3 dimensional complexity

Nature of Osseo integration

Osteoclasts,resorb bone matrix in a 3 dimensional complexity at a sub-micron scale range. why 3 dimensions

1- Because of the morphological features of the osteclast / bone matrix interface.

2- Because of the varying orientation of the collagen fiber bundles in bone.

This will result in the cement matrix deposition by osteoblast to fill this 3 dimensional complex surface, resulting in a mechanical anchorage of new to old bone.(interdigitate and interlock).

SLA
Treated rough Surface of the implant

Peri- implant healing

Bone Healing in Osseo integration is activated when non collagenous proteins and growth factors are set free by the drilling of bone which exposes the pre-existing bone matrix to extra cellular fluid

.

Attracted by chemotaxis, 0steoprogenetor cells coming from bone marrow, endocortical and periosteal bone envelop, migrate into the site of the lesion proliferate and differentiate into **Osteoblasts** which start bone deposition on the walls of the defect , fragment ends and on the implant surface….

Osseo integration follows a common biologically determined program that is divided into 3 stages :

1- Incorporation by Woven Bone.

2- Adaptation of Bone Mass to Load.

3- Adaptation of Bone Structure to Load,(Bone Remodeling).

1- Incorporation by Woven Bone

Inflammatory Reaction which is provoked by surgical trauma and modified by the presence of the implant.

- Initially hematoma is formed at the bone implant interface which play a role as a **scaffold** for peri implant healing

-- Platelets activation, migration

--activation of inflammatory cells

-- Osteoblasts adhesion, proliferation and protein synthesis and deposition either in direct contact with implant surface or directly as an early a fibrillar interfacial zone comparable to cement line, which is rich in non –collagenous proteins

The early deposition of calcified matrix is followed by Woven Bone Formation to ensure tissue anchorege.This peri -implant osteogenesis progress either from the host bone towards the implant surface (Distance Osteogenesis) (A), or from the implant surface towards the healing bone (Contact Osteogenesis.) (B)

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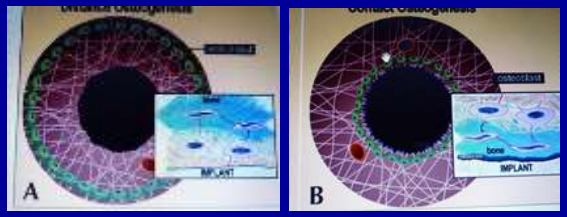


Woven Bone usually starts growing from surrounding bone towards the implant , except in narrow gaps where it is simultaneously deposited upon the implant surface.

Woven Bone grow by forming scaffold of rods and plates and thus is able to spread out into the surrounding tissue at a relatively rapid rate.

The formation of primary scaffolds is coupled with the formation of vascular net which result in the formation of a primary spongiosa that can bridge gaps of less than 1 mm within a couple of days.

Woven Bone formation clearly dominates the scene within 4-6 weeks after surgery.

2- Adaptation of Bone Mass to load

Starting in the second month after implantation, the microscopic structure of newly formed bone (woven bone);changes, either towards the well known lamellar bone or towards an equally important, but less known modification called Parallel Bone Change.

Parallel-fibered bone is an intermediate between woven and lamellar bone, the collagen fibrils run parallel to the surface, but without preferential orientation in that plane.

The linear apposition rate for lamellar bone amounts to 1-1.5 ym /day

And for parallel fibered bone it is 3-5 times larger.

Both types can not form a scaffold like woven bone, but merely grow by apposition on a preformed solid base.

3- Adaptation of Bone Structure to Load (Bone Remodeling)

Bone Remodeling starts around the third month after several weeks of

Increasingly high activity, it slows down again, but continues for the rest of life.

In cortical bone as well as in cancelous bone, bone remodeling occurs in discreet unites called Bone multicellular unite.

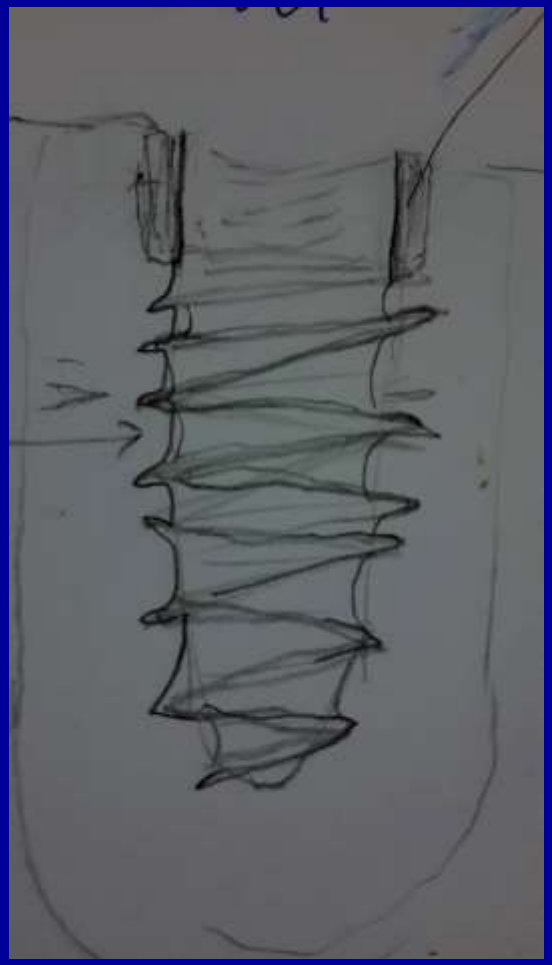
Primary Stability of the Implant

CANCELLOUS BONE & BONE MAROW

Contribute less to primary stability.
less bone density.
but has bone marrow, vascularity, and osteoblasts.

Bone implant contact is achieved by bridging the inter trabecular marrow space by Scaffolds of Woven bone.
The free end of the trabeculae and the thread of the implant wi narrow the gape to be covered with woven bone.

Once this is established the they are reinforced by lamellar bone and the subjected to continues remodeling improving the bone quality.



CORTICAL BONE

By Press Fitting and Congruency.
This leads to direct bone contact.
this is not recommended because of bone necrosis…need a space of 50-100ym

After 3 months this space is filled with lamellar bone formed at the 2nd stage Osseo integration.

Cortical remodeling contribute to the increase in the interface between implant and bone to 60-70% after 15 months

Implant Material and Surface Topography

Role of implant surface :

1- implants are made of Titanium, grad 4.

Titanium is 10000 times resistance to corrosion than gold.

Layer of titanium oxide is formed immediately coating the surface.

2- The surface of the implant is SLA, (Sand Blasted Acid-etched.

the resulting surface topography offers the ideal surface for cell attachment, and this will result in 10 times more surface area to get shorter healing time.

- Objectives of SLA

1- Less number of implant necessary.

2- Shorter implants

3- Shorter healing period.

3- Micro texture and chemistry of the surface of implant promote early healing by retaining fibrin during the critical osteogenic cell migration

phosphate Coating of implant surface.

they readily adsorb protein to their surface, this would increase the binding of fibrinogen that would lead to increase platelets adhering and platelet activation which accelerate healing. This protein adsorption could also lead to increase improvement of fibrin binding to implant surface., that **would enhance osteogenic cells to migrate to the surface.**

Peri-implant Healing Mechanism

3- Role of Implant Surface

1-Potentiate the Activation of Platelets.

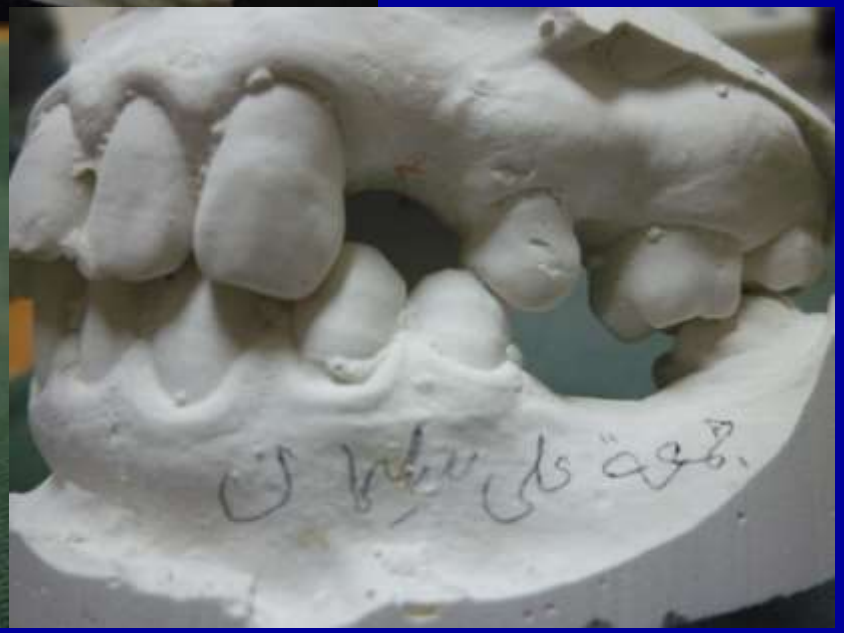
2-Provide the features for fibrin attachment

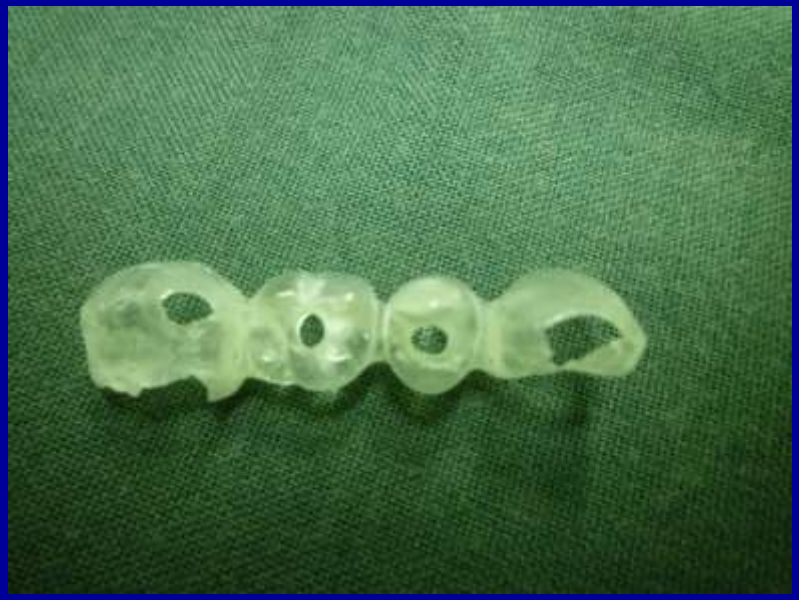
3-Increase the available surface for fibrin attachment.

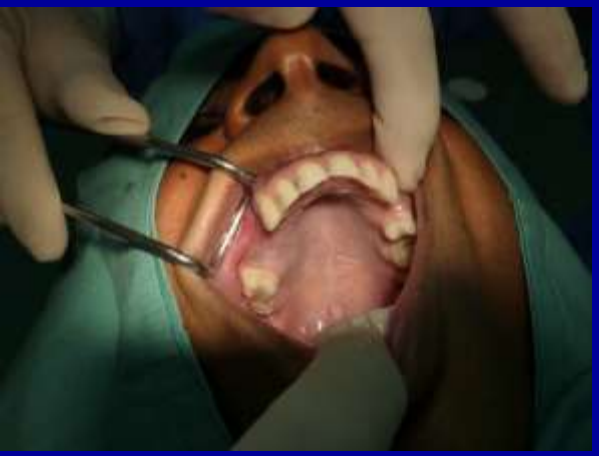
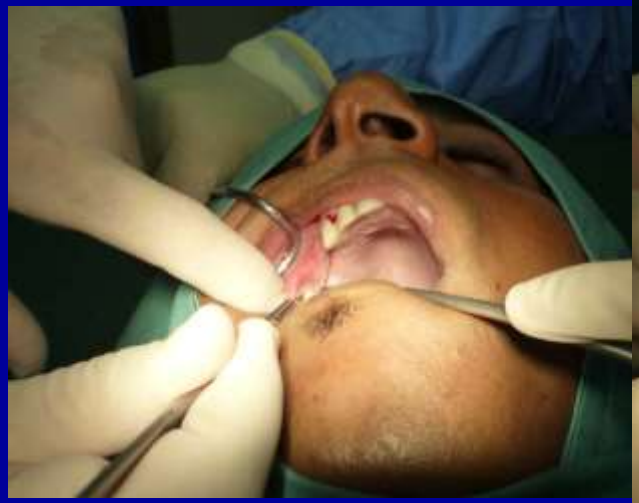
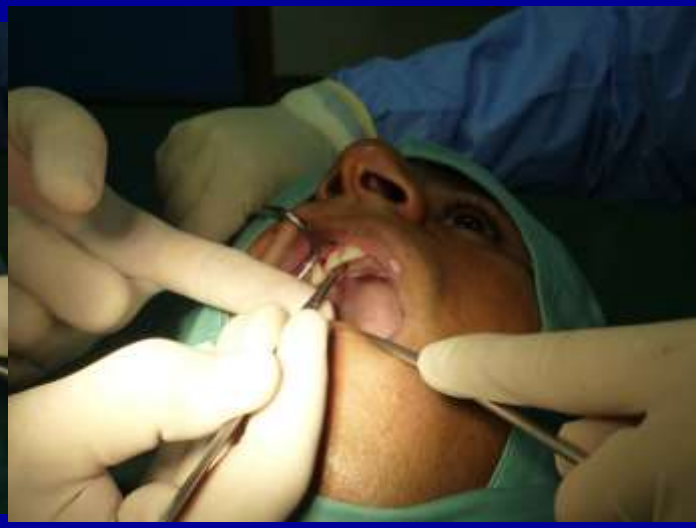
4-Provide the 3 dimensional surface for cement line deposition and interlocking with the implant surface .

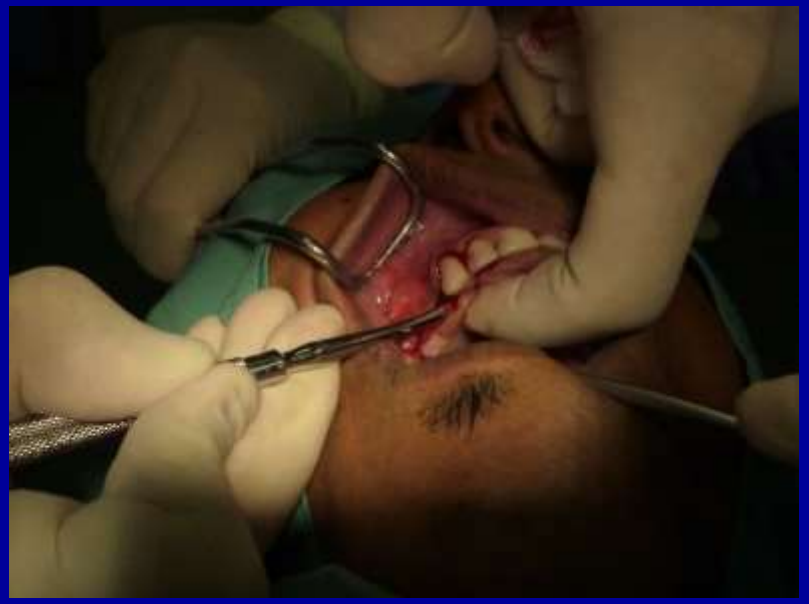
What we gather

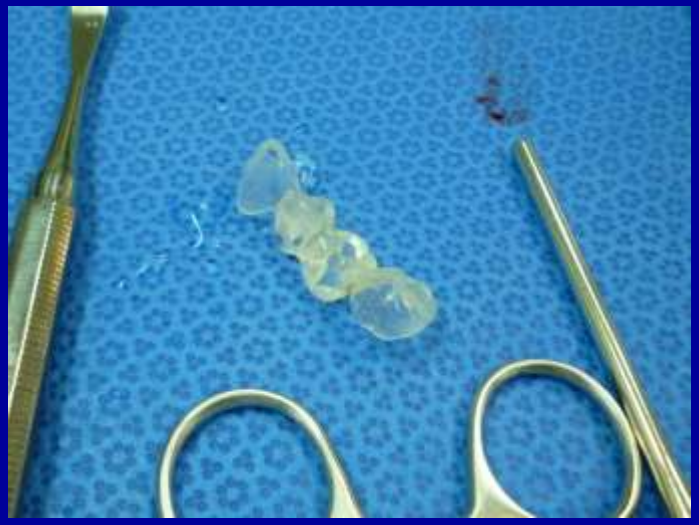
1- Slow rotation of the handpeice.
2- Good water coolant.
3- At least one mm of healthy spongiosa bone around the implant
4- Good amount of spongiosa bone.
5- Good amount of cortical bone for primary stability
6- Three dimensional surgical placement of
7- The upper part edge of the rough part of the implant must be with the level of crestal bone, respecting the Biological Width.
8- Any bony dehiscence or inadequacy must be covered with a bone graft or with bony substitute.
9- Implant surface must not be touched by hand or any other instrument to preserve the surface for fibrin attachment.
10- The surgical site must be kept to minimum, the same diameter as the implant.
11- Make sure to a good primary stability, by having good amount of cortical bone.



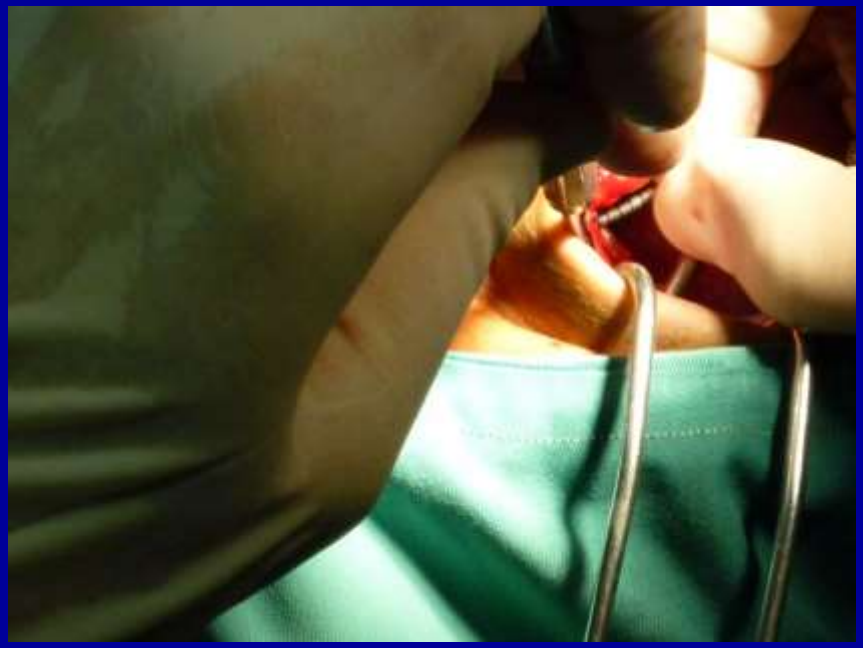


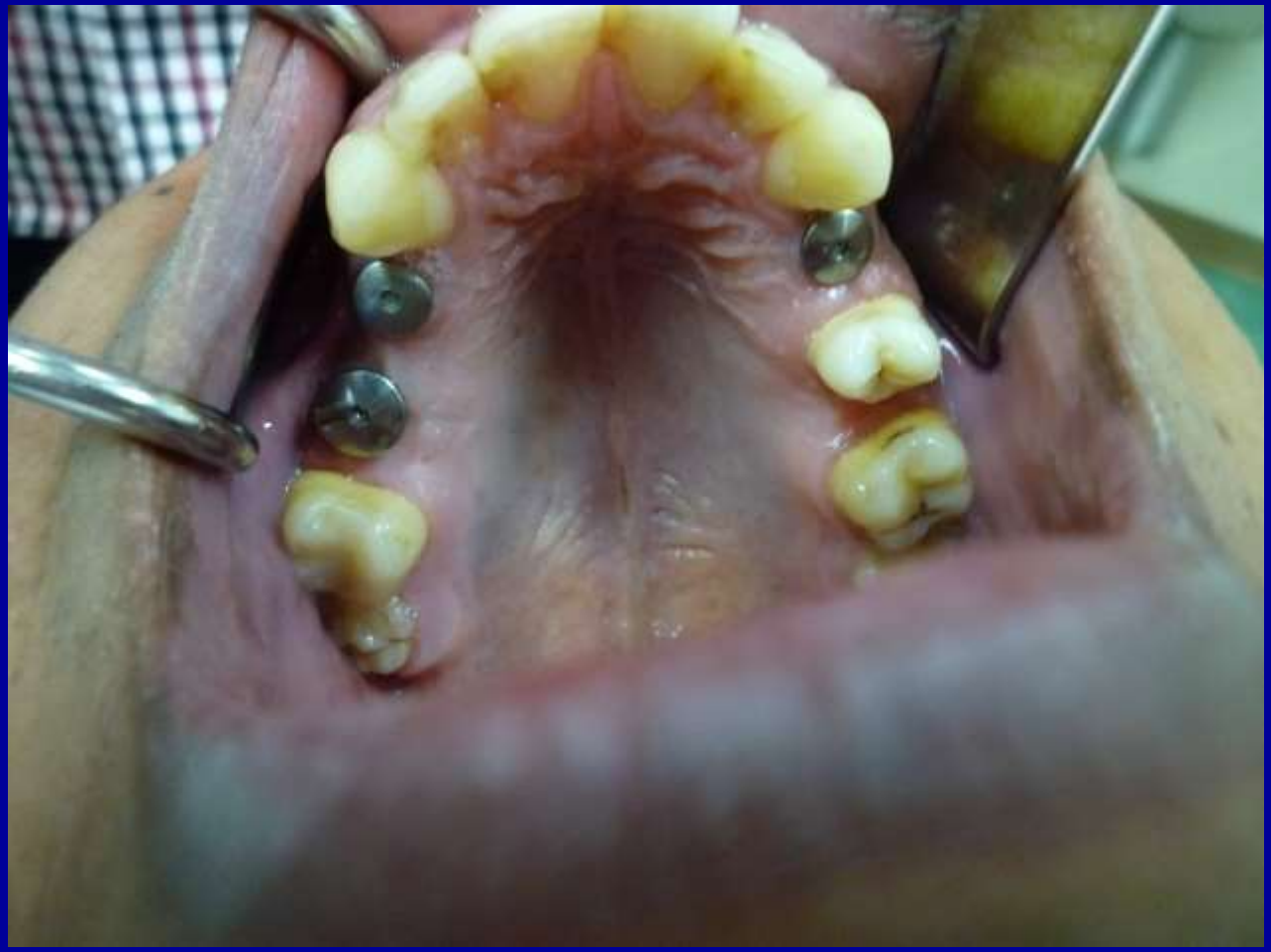




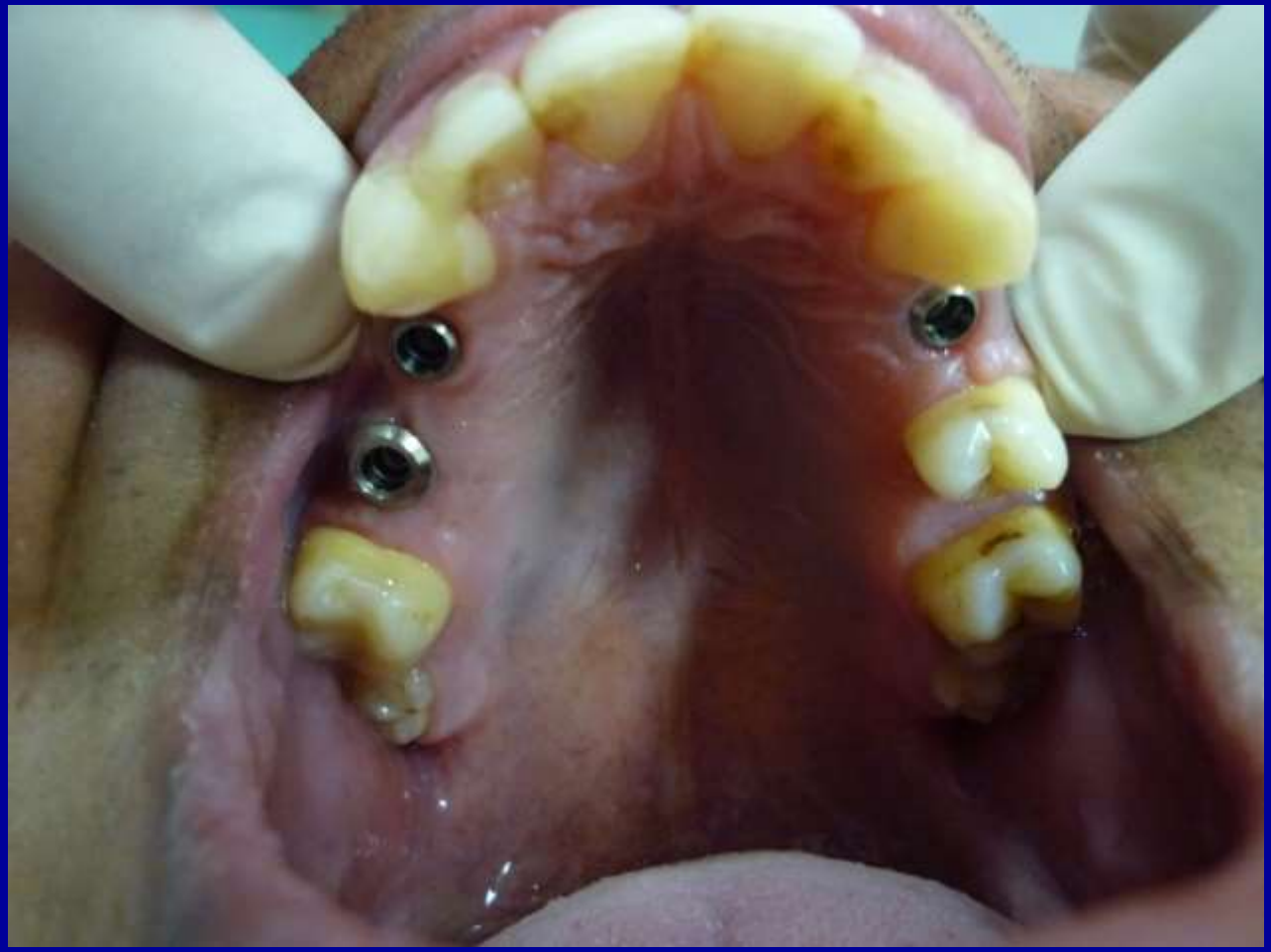


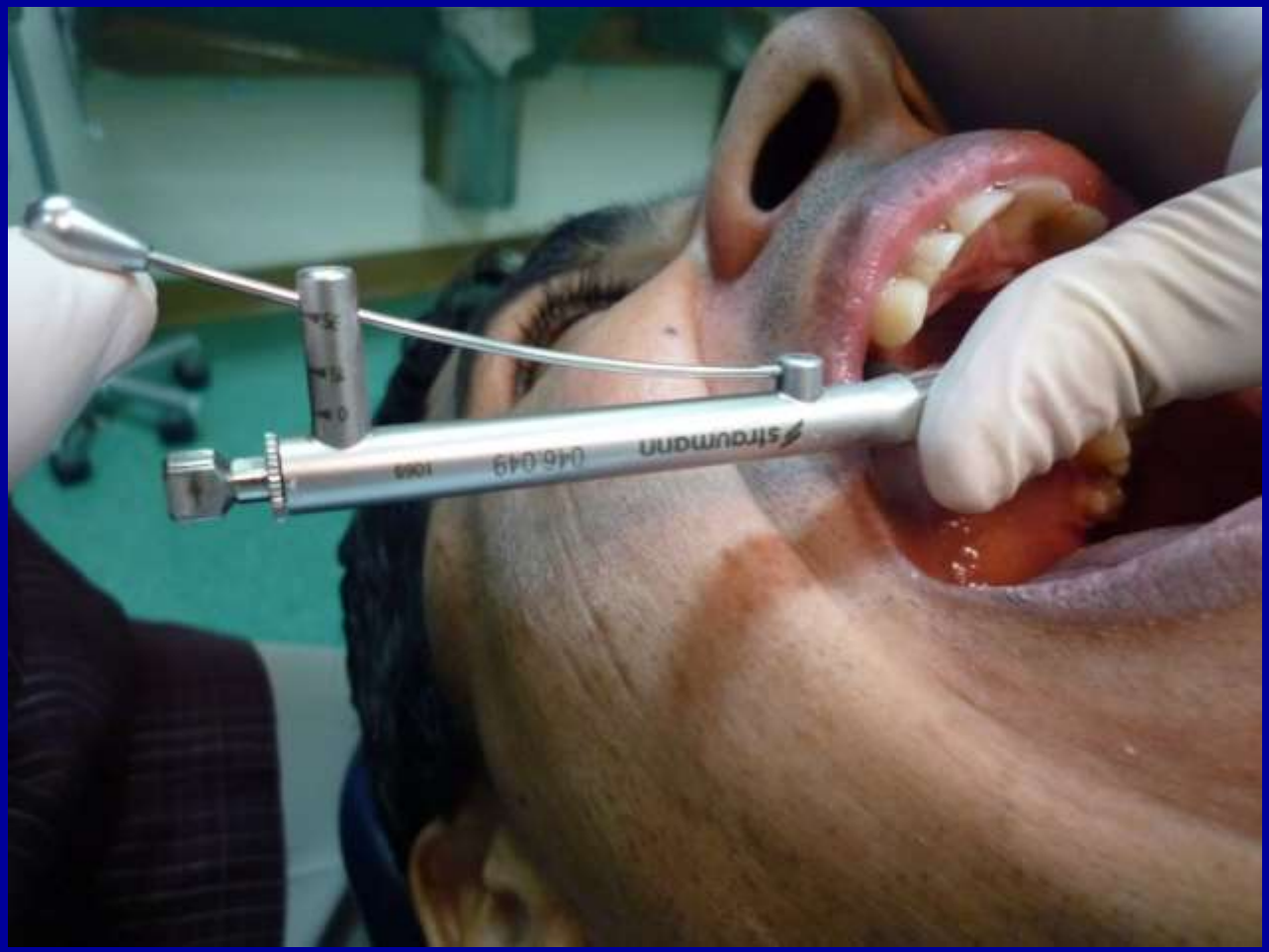






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