

**Lessons In Life Will Be Repeated  
Until They Are Learned**



**Good Afternoon.**

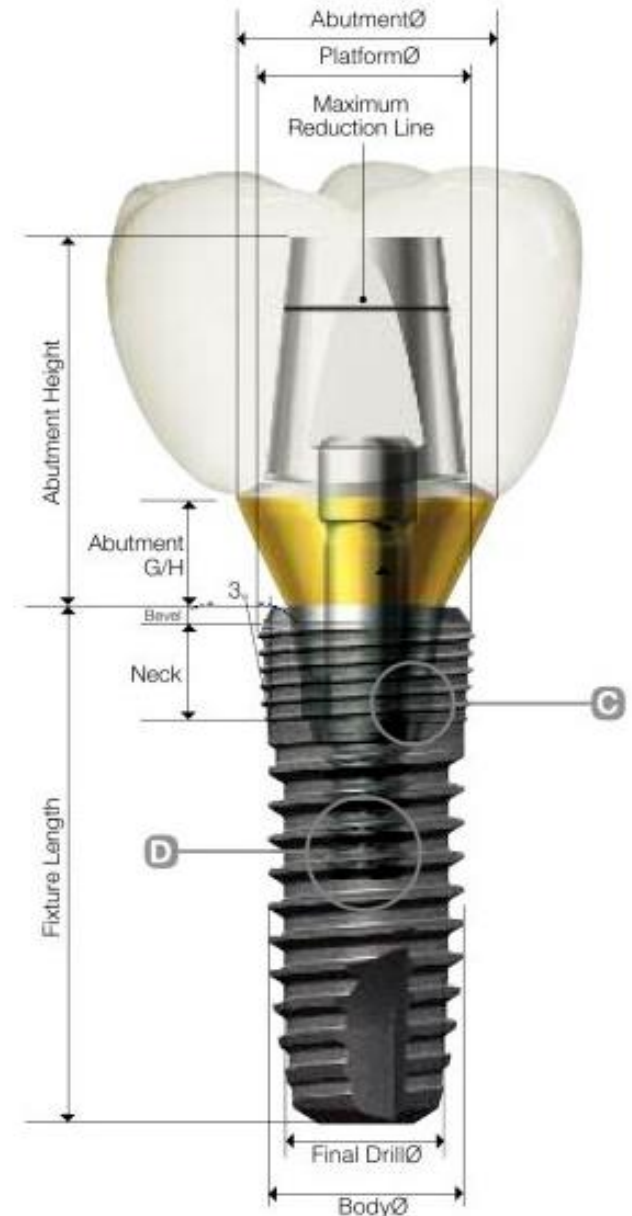
# **GUIDELINES AND RATIONALE OF ABUTMENT SELECTION AND DESIGNING IN IMPLANT RESTORATION**

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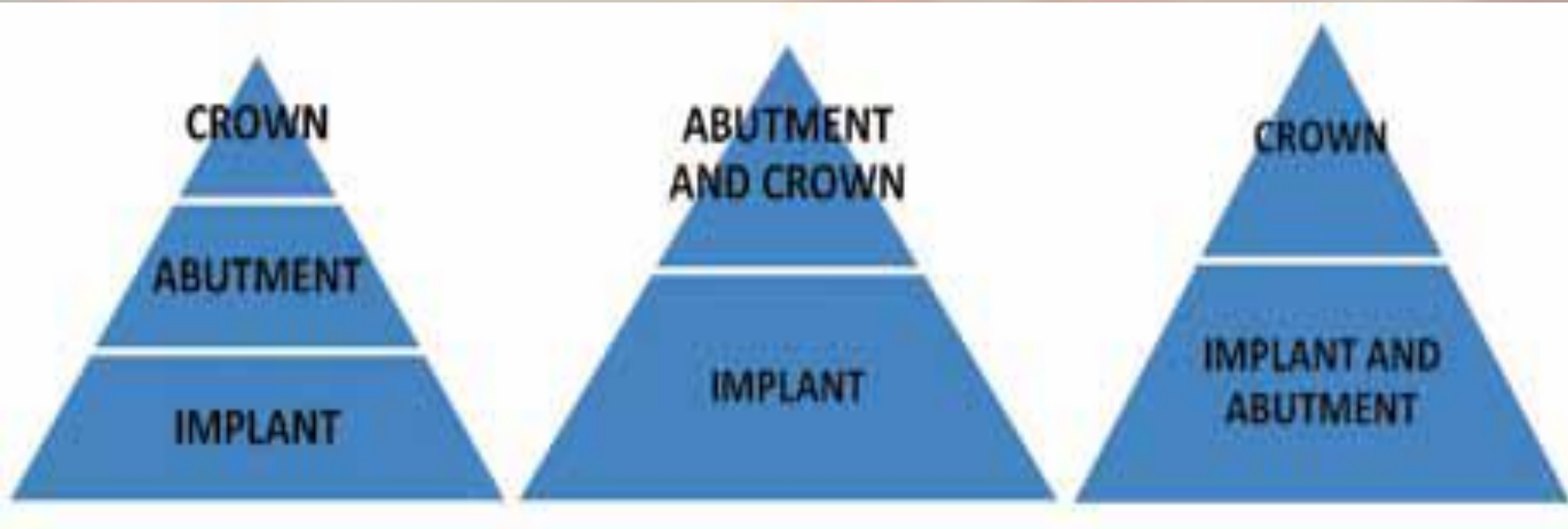
# DEFINITION

## IMPLANT ABUTMENT

An abutment is a component that is intermediate between the implant and the restoration and is retained to the implant by a screw or locking taper.



# IMPLANT TIER SYSTEM



**Three-Tier System**

**Two-Tier System**

# CLASSIFICATION

A) Depending upon retention

- Abutment for screw retention
- Abutment for cement retention
- Abutment for Attachment



B) Depending upon angulation

- Straight abutment
- Angled abutment

c) Depending upon materials

Titanium

Stainless steel

zirconia

d) Depending upon  
manufacturing

Stock

Customized ( CAD-CAM ,  
CASTED)



# TYPES OF ABUTMENT DEPENDING ON RETENTION

1-Abutments for Cement retention

2-Abutments for screw retention

3-Abutment for attachment

# 1-ABUTMENTS FOR CEMENT RETENTION

- a) Better passivity
- b) Easier to obtain esthetics
- c) Fewer porcelain fractures due to occlusal surface integrity
- d) Less fatigue
- e) Manipulation in posterior region easier with cement
- f) Loosen less often as compared to that of screws



# DISADVANTAGES

- Difficult to be retrieved unless soft cements are used.
- Gingival retraction may be needed
- When permanent cements are used evaluation and maintenance may sometimes be difficult



# TYPES OF ABUTMENT FOR CEMENT RETENTION

## 1- internal hex

a. non hex type: Single unit or one piece abutment does not engage antirotational hex but fits flush with the implant platform.

b. Hex type: Has one component to engage antirotational hex of implant body



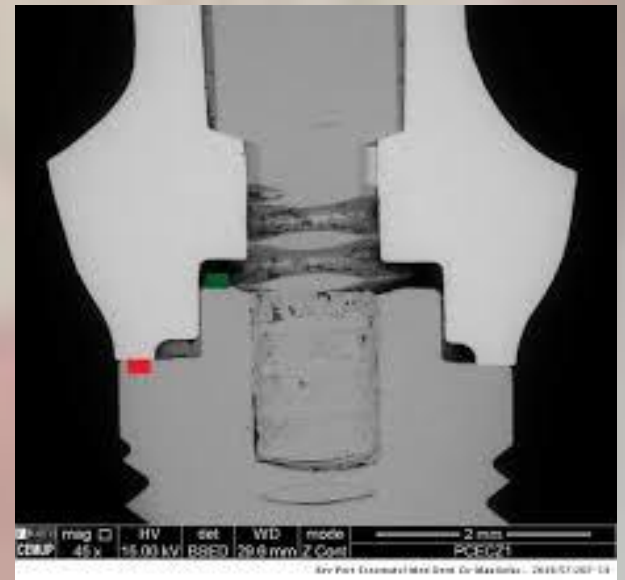
## advantages

- distribution of intraoral forces deeper within the dental implant
- reduced stress on crestal bone, prevent excess screw loading
- reduced the potential microleakage and enhanced strength of joint interface when compared with external hex design.

## 2-External hex :

usually used with short implant

- ⊙ Early configurations was the external hexagon incorporated in the dental implant systems. However over years it demonstrated drawbacks -
- ⊙ abutment screw loosening and fracture.
- ⊙ mechanical irritation of the tissues and ingress of bacterial toxin fluids.
- ⊙ negative effect on the stability of the peri-implant hard and soft tissues.





External  
hexagon



Non Hex  
type



Internal  
hexagon

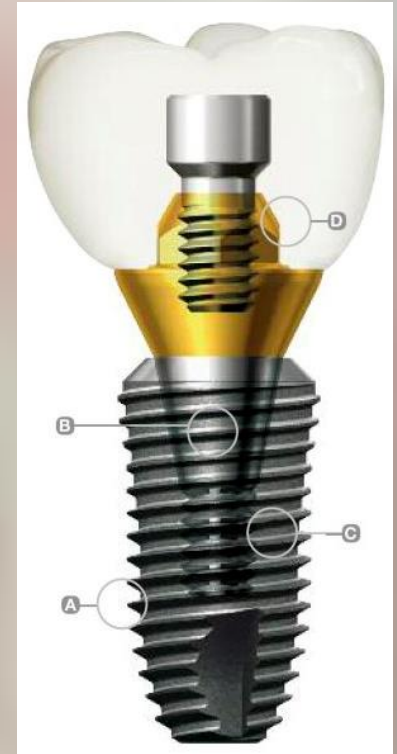
# 2-ABUTMENTS FOR SCREW RETENTION

## ADVANTAGES

- Good retention
- Less momentum of force
- No risk of cement in the sulcus
- Easily retrievable.

## DISADVANTAGES

- Loosening of the screws
- Difficulty to obtain passivity
- Difficult to obtain esthetics
- Greater chances of porcelain fracture
- Access to posterior regions difficult - risk of aspiration.



# FACTORS THAT AFFECT SCREW CONNECTION

1. Misfit
2. Poor abutment screw tightening
3. Excessive occlusal loading
4. Settling of screws or abutment
5. Inadequate screw design

Guidelines usually recommend the screws to be tightened 25-35 by torque ratchet



# 3-ABUTMENT FOR ATTACHMENT

Used as an attachment device to retain a removable prosthesis.

Includes ball abutments, mesostructure bars- continuous and non continuous

Superstructure attachments -magnets, clips, hader clips, dolder clips, ceka attachments, ERA attachments, Locators(Zest Anchors).

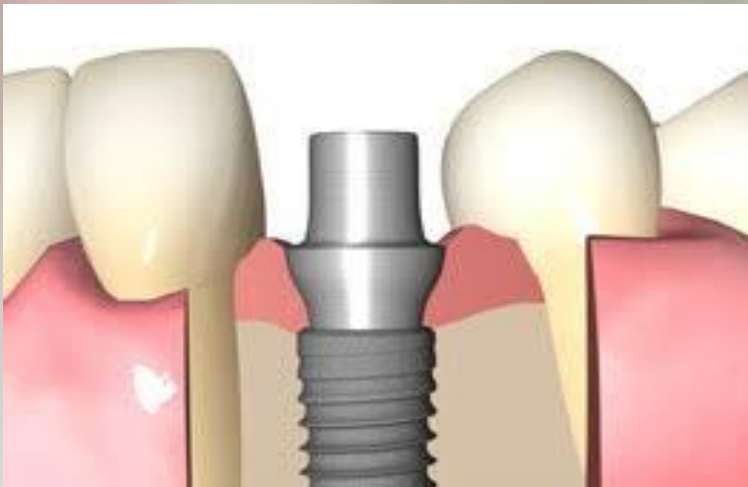




# GUIDELINES FOR ABUTMENT SELECTION

## A) DEPTH OF SOFT TISSUE

- ◉ Vertical height from implant head to gingival margin.
- ◉ Measured with periodontal probe
- ◉ Labial margin of abutment is atleast 1 mm subgingival
- ◉ Marked discrepancy between gingival heights around the margin - preable abutment is indicated
- ◉ Diameter close to that of cervical margin of tooth.



## B) IMPLANT-ABUTMENT INTERFACE GEOMETRY

- ◉ *external hexagon* incorporated in the dental implant systems

### *internal hex*

- ◉ Furthermore, included in such effort is the “*Morse*” *taper (hex free)* with more predictable clinical success rate.



# CLINICAL RECOMMENDATION

- During abutment selection on the basis of implant-abutment connections, clinician should consider the topography of bone, size of implant used , available soft tissue characteristics, force component such as rotational, the prosthetic components required particularly for aesthetic purpose, and single-implant restoration. Finally, clinician can make a decision based on personnel choice.

## C) IMPLANT RESTORATIVE PLATFORM

“Platform switching” Implant restorative platforms are the interfaces for implant-abutment connections. The selection is based on the size, of the teeth that are being replaced, and diameter may be same as, or narrower than the implants.



# CLINICAL RECOMMENDATION

It is a promising strategy in term to reduce or eliminate the crestal bone loss around the implant. Now, the design of dental implant, along with abutment encompasses the concept of maintaining “horizontal biologic width” through built-in platform switching.



PLATFORM  
SWITCHING



## D) PROFILE OF HEALING/INTERIM ABUTMENT

Healing abutment placement is based on the surgical technique followed i.e., immediately placed during single stage surgical procedure or later at two-stage surgical protocol to guide the healing of soft tissue to replicate the contours and dimensions of natural tooth that is being replaced and to ensure access to the implant restorative platforms for impression and definitive abutment placement



# E) ORIENTATION OF IMPLANT

- ❖ This evaluates the implant in relation to the final prosthesis and the adjacent teeth. Malpositioning of dental implant may be in any plane either vertical, mesial/distal or facial/lingual plane. These could be most common reason for using custom-processed abutments.
- ❖ However, if the dental implant is placed at planned location of the teeth, prefabricated abutments may be used at predictable result and low cost.
- ❖ This criterion is particularly important in deciding whether implant restoration will be screw- or cement-retained.
- ❖ The main advantage of screw-retained prosthesis is easily retrieval of prosthesis in case of repair or screw loosening . In case of a cementable restoration, the angulations are not as critical since there is no screw-access opening which may interfere with esthetic and/ or function (in case of screw-retained prosthesis).
- ❖ However, most anatomical variation influences the implant body angulations and hence, the abutment selection.

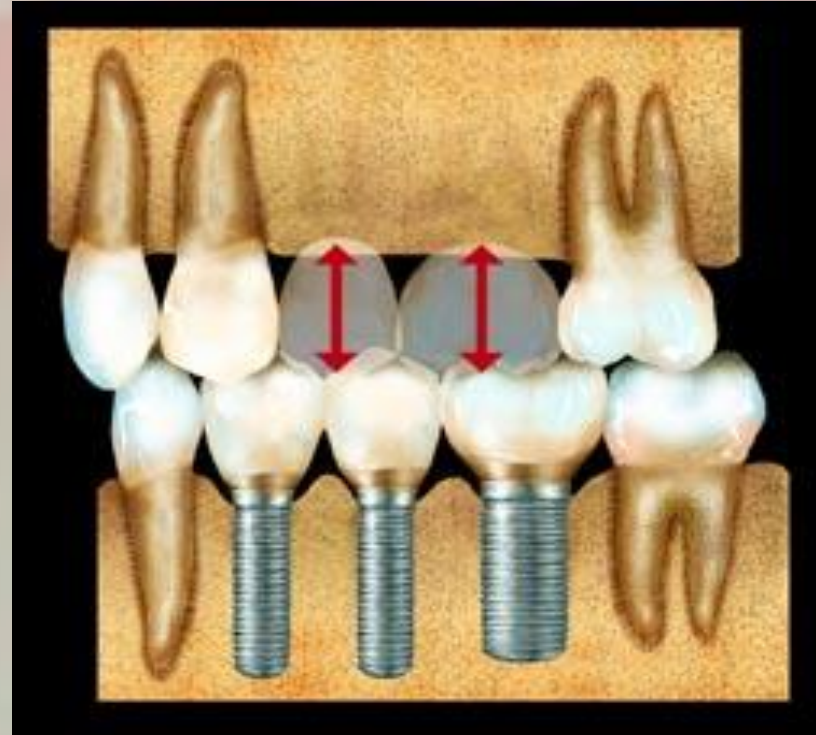


## F) INTEROCCLUSAL SPACE

Interocclusal space corresponds to the vertical distance between the superior surface of the implant and the opposing dentition in maximum intercuspation.

This interocclusal space is the total height available for the abutment plus the restoration.

At least 2.8 mm of interocclusal space is necessary to restore an implant because of the limitations in commercially available abutments.



# CLINICAL RECOMMENDATIONS

A meticulous clinical examination including the diagnostic mounting in maximum intercuspation would facilitate recording the interocclusal space. This will later facilitate the selection of prefabricated or custom-made abutment. Hence, selection is made at initial treatment planning phase under individual clinical need.

## **G) DEPTH OF PERI-IMPLANT SOFT TISSUE**

- ❖ Tissue height or peri-implant sulcular depth is the distance from the superior surface of the implant to gingival margin. This is measured 6-8 weeks following the surgery.
- ❖ Ideally, in esthetically important areas the margin of the restoration is 1-2 mm subgingival. The tissue height is not as critical if the restoration is not in the esthetic zone and a supragingival margin is planned.

### **Clinical recommendation**

In the area with optimum esthetical requirement, appropriate abutments may be used to contour the peri-implant soft tissue and to develop optimum emergence profile .



# ABUTMENT RETENTION IN CEMENT RETAINED IMPLANT ABUTMENTS

- The retention of a fixed cemented restoration-resist removal of the retainer along the path of insertion .
- Resistance - opposes movement of the abutment under occlusal loads and prevents removal of restoration by forces in apical and oblique direction.

# The tenets of retention and resistance include

## 1) ABUTMENT TAPER

- Retention of a crown decreases as the taper is increased from 6-25°.
- Parallelism of axial walls has been recognised to be single most factor for retention.
- Eames et al - found that clinically acceptable preparation present a taper of 20°.



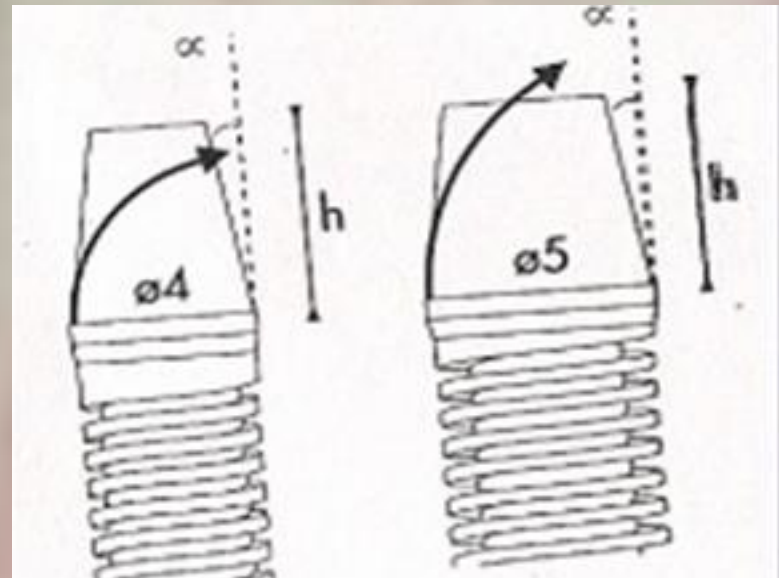
- **2) ABUTMENT SURFACE AREA**

- There is a linear increase in retention as the diameter increase for preparation with identical height.
- Diameter of implant abutment for cement retention is often less than 5 mm which is comparable to prepared lateral incisor - so decrease in surface area results in poorer retention than most natural abutment.

### 3- ABUTMENT HEIGHT

A tall preparation offers greater retention than a short abutment

- Increase in height increase surface area , increased resistance to lateral forces.
- Height of the abutment must be greater than the arc formed by the crown rotating about a fulcrum at the margin of the opposite side of the restoration.



## 4) ABUTMENT SURFACE ROUGHNESS

- Surface roughness increase the retention of a restoration by creating microretentive irregularities into which the luting agent projects.
- Surface roughness retention is dependent upon the type of burs along with the type and thickness of luting agents.
- Coarse diamond increase amount and depth of scratches on the surface to more than 40 micrometer.
- Internal aspect of the casting should be air abraded with 50 micrometer alumina to enhance retention by 64%.



# CUSTOMISED ABUTMENT

Milling Titanium to create and customize abutment applying CAD/CAM technology instead of casting metal from wax up using traditional UCLA (castable) abutment.

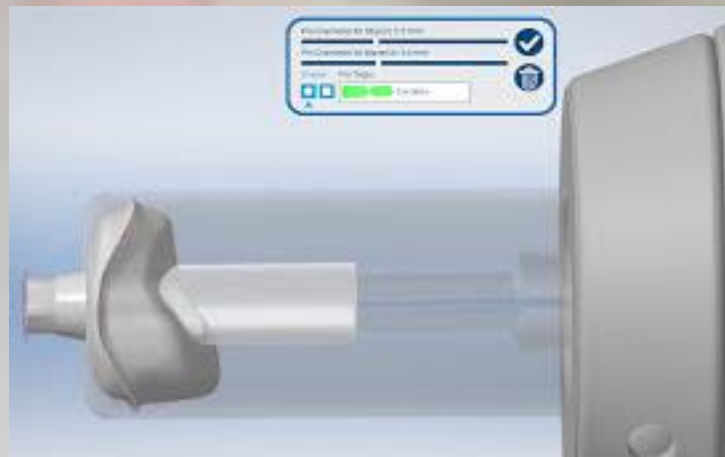
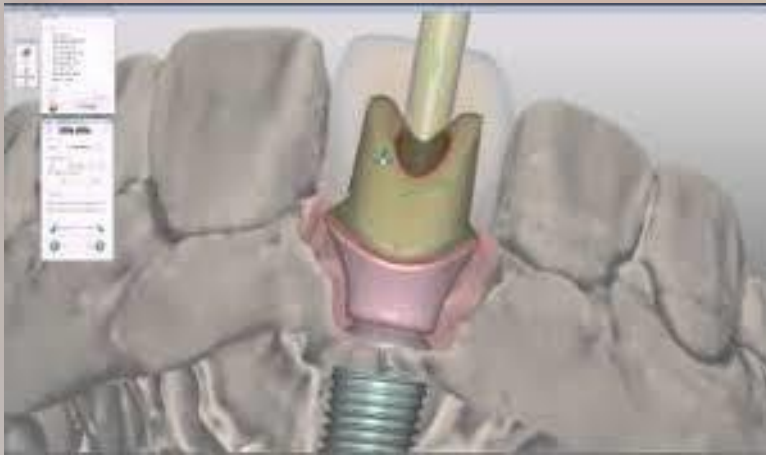
- ◎ Patient specific abutment solution
- ◎ Ideal for optimised function , esthetics and simplicity.

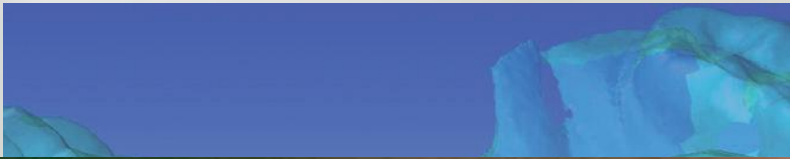


# VIRTUAL DESIGN AND MANUFACTURE OF ABUTMENTS

Previous CAD-CAM : WAX -SCAN -MILL approach

A manufactured custom abutment is first virtually created within the design software by *virtual tools before it is machine milled*. The virtual design contains all the implant analogs (that reproduce the intra-oral implant placements) surrounded by a removable soft tissue reproduction.





CROWNS CEMENTED

10 3 8

# MACHINE MILLING AND FINISHING

Custom abutments are milled from titanium or ceramic rods, once the virtual design of the abutment is completed.



# ADVANTGES OF CAD-CAM ABUTMENT OVER STOCK ABUTMENT

- ◎ Abutments are **precision** created by smart software requiring no lab technician skill or knowledge to obtain an optimally shaped custom abutment.
- ◎ surface characteristics of a virtually design abutment are **superior** to cast abutments because each abutment is precision milled and highly mechanically polished.
- ◎ Each abutment is a **one-piece entity** with no abutment cylinder-alloy interface utilized. Therefore, abutments have higher **mechanical tolerances** for compromised implant placement alignment or when employed in tissue-deficient areas.



- ◎ It is easy to have **precise duplicates** made, giving the lab technician the exact shape of abutment that the patient needs. Duplicate abutments eliminate any inexact stone reproductions obtained through conventional impression procedures. Crown-abutment fit is therefore improved.
- ◎ Any compromised **abutment contours** can be **virtually modified** to improve the abutment regardless of abutment material used (e.g. zirconia, gold hue, titanium).
- ◎ Because the **machining** process is completely **software driven** and occurs irrespective of the chosen abutment material, any future abutment materials developed (e.g. lithium disilicate, composites) will easily fit into the manufacturing process.

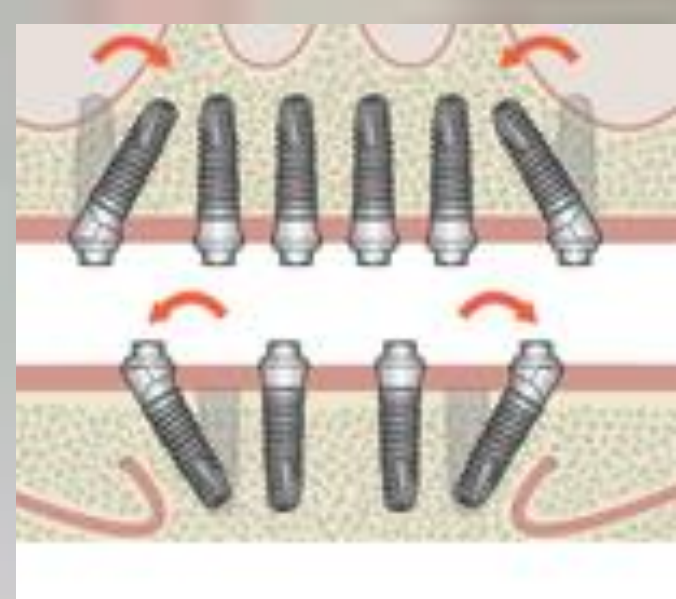
# ABUTMENT RELATION TO PERI-IMPLANT TISSUES

## CONTOURING THE SOFT TISSUE WITH PROVISIONAL AND CUSTOM IMPRESSIONS

- ❖ In order to optimize esthetic outcomes, it is essential, for most sites, to place a **provisional restoration** onto the implant subsequent to healing.
- ❖ Customisation to facilitate the **maturation and stabilization** of peri-implant soft tissues. These procedures are the most predictable and practical method of insuring a natural esthetic soft tissue profile.
- ❖ Desired peri-implant soft tissue profile can be achieved with the provisional restoration, an accurate cast should be made .
- ❖ **Custom abutments** can be either waxed and cast onto machined cylinders or machined from titanium or zirconia using CAD, or copied from a waxed form .

# SMARTFIX ABUTMENT / TRANSMUCOSAL ABUTMENT

- ◉ Application in All on 4 / All on 6 concept. (Tilted implant concept).
- ◉ Smartfix available in 15° and 30° angulation i.e. Allows 30° and 60° of divergence between adjacent implants.
- ◉ Transmucosal abutment available in 17° and 30°
- ◉ Available in different gingival cuff heights to raise the prosthetic platform supragingivally on which hybrid prosthesis seats.







**THANK YOU**  
*for your attention!*