



Zirconia implants in anterior esthetic region

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the goal of achieving optimally esthetic implants and prosthesis in the anterior region still the major challenge, although the traditionally available titanium implants show excellent survival rate and osseointegration but the grayish color of them may shadow through thin soft tissue. Many classifications have been introduced to illustrate the gingival biotype:

Year	Author	Classification	Basis
1923	Hirschfeld ²	- Thin gingival form - Thick gingival form	Based on the alveolar contour
1969	Oschenbein&Ross ¹	- Scalloped and thin - Flat and thick	Contour of gingiva closely followed the contour of bone
1977	Weissgold ⁴	- Thin in scalloped periodontium - Thick in flat periodontium	On form and function
1986	Claffey and Shanley ⁷	- Thin ($\leq 1.5\text{mm}$) - Thick ($\geq 2\text{mm}$)	Based on thickness
1991	Olsson & Lindhe ³	- Thin - Thick	- Based on gingival morphology and its types based on tooth dimensions that is cw/cl ratio of tooth, giving two forms of teeth - long and narrow - short wide and square
1996	Kois ²	- Normal (alv crest 3mm apical to cej – 85%) - High (alv crest less than 3mm- 2%) - Low (alv crest more than 3mm-13%)	- Based on the relationship between alveolar crest and CEJ - He said that clinical outcomes are strongly related to the gingival or alveolar crest form.
1997	Muller & Eger ¹²	- Normal - Thin - Thick	Based on gingival morphology via. Cluster analysis.
2008	Aimetti et al ²¹	- Thin (less than 1mm) - Thick (more than 1mm)	Based on the gingival thickness.
2009	De rouck et al ⁸	- Thin - Medium - Thick	Based on the transparency of gingiva when probe is inserted.
2010	Kan et al ¹⁰	- Dense and fibrotic (thick) - Delicate, friable and translucent (thin)	Based on the tissue make up and morphology.



Thick gum

vs.



Thin gum

After implant fixation and prosthetic part construction, important esthetic scores indices should be taken into consideration which are pink and white esthetic scores in comparison with contralateral teeth.

Variables		Score	
0		1	2
Pink esthetic score (PES)			
Mesial papilla	Absent	Incomplete	Complete
Distal papilla	Absent	Incomplete	Complete
Curvature of facial mucosa	Major Discrepancy	Minor Discrepancy	No Discrepancy
Level of facial mucosa	Major Discrepancy	Minor Discrepancy	No Discrepancy
Root convexity/ soft tissue color and texture	Major Discrepancy	Minor Discrepancy	No Discrepancy
Maximum score of PES		10	
White esthetic score (WES)			
Tooth form	Major Discrepancy	Minor Discrepancy	No Discrepancy
Tooth volume/outline	Major Discrepancy	Minor Discrepancy	No Discrepancy
Color (hue/value)	Major Discrepancy	Minor Discrepancy	No Discrepancy
Surface texture	Major Discrepancy	Minor Discrepancy	No Discrepancy
Translucency	Major Discrepancy	Minor Discrepancy	No Discrepancy
Maximum score of WES		10	



Pink esthetic score



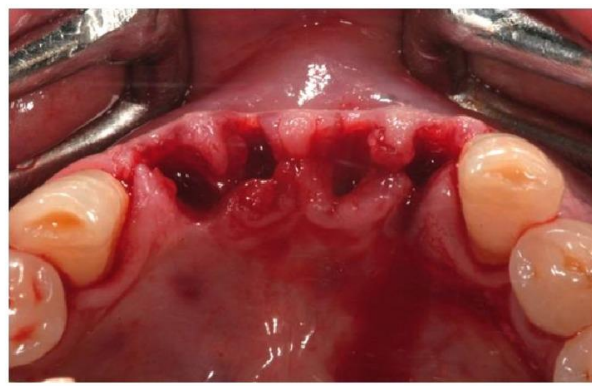
White esthetic score

Zirconium dioxide implants (ZrO_2) have emerged as promising substitute for titanium implants, as zirconia is chemically stable, biocompatible, has favorable biological and mechanical properties with excellent osseointegration to bone. Most dental grade zirconia is manufactured as 3-5% yttria-stabilized tetragonal zirconia polycrystals (Y-TZP) (Kelly & Denry, 2008). Zirconia implants manufactured in three types (one-piece, two-piece and RAZ), in a study evaluating the 4-years follow up of one-piece zirconia implants, radiographic measurements showed preservation of crestal bone adjacent to the implants with marginal bone loss ranging from 0.9-1.6mm during the first year in function and not exceeding 0.2 mm with in 4 years after surgery in accordance with Albrektsson implant success criteria. These properties are due to biocompatibility, good osseointegration, less plaque adhesion and the absence of microgap between fixture and abutment, on the other side it has been found more peri-implant marginal bone loss in tow-piece implants due to the presence of microgap (Borgonovo AE, Censi R, 2015).





Preoperative clinical view



Dental extraction



One-piece zirconia implant



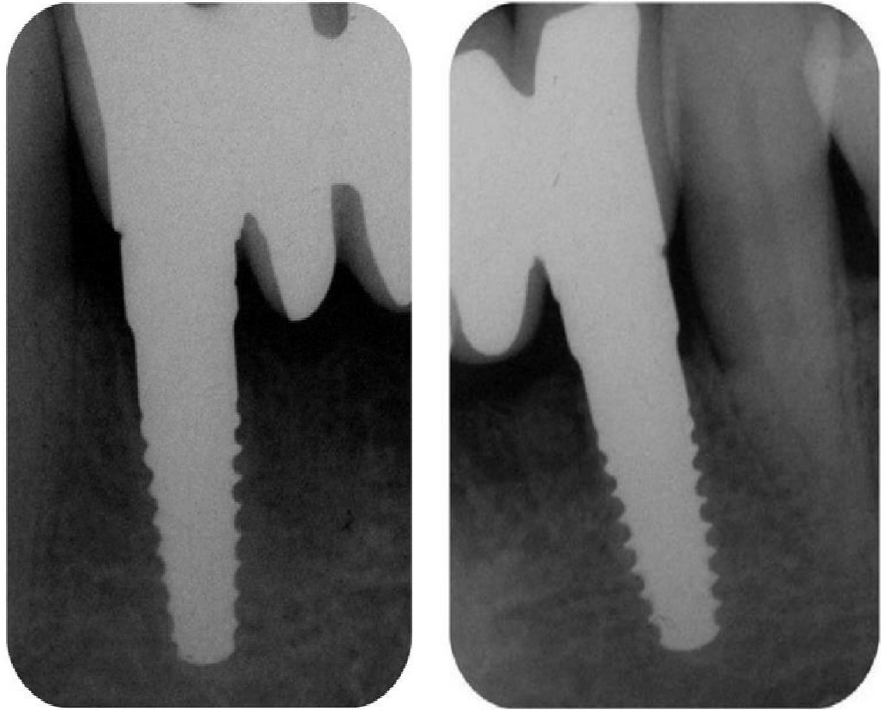
Immediate temporary restoration



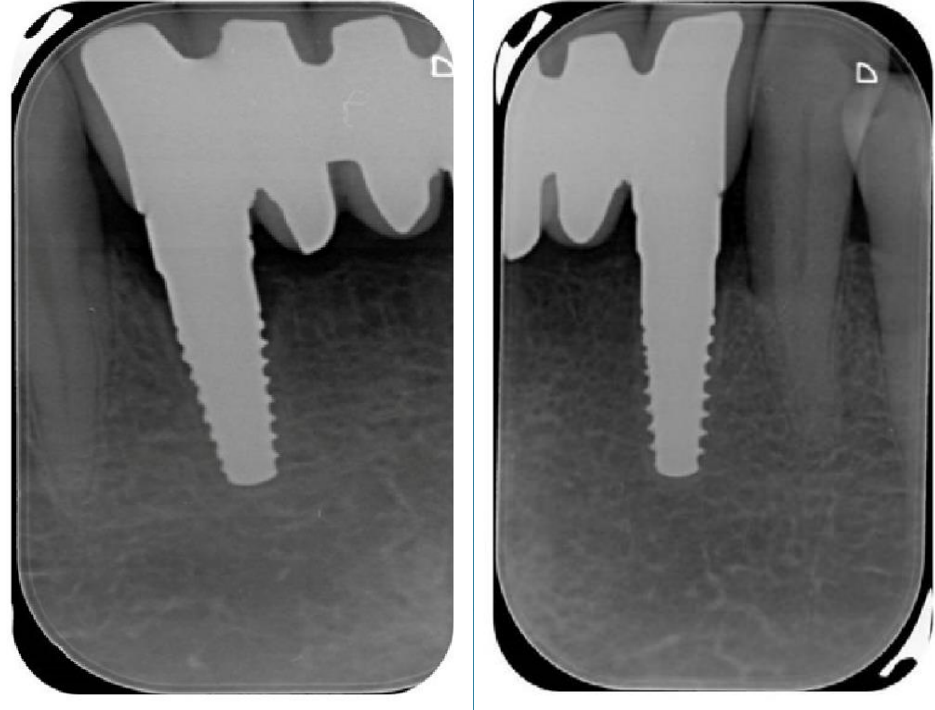
Healing after 6 months



Final restoration



x-ray of zirconia implants 6 months after surgery.



x-ray after 4 years of implants insertion

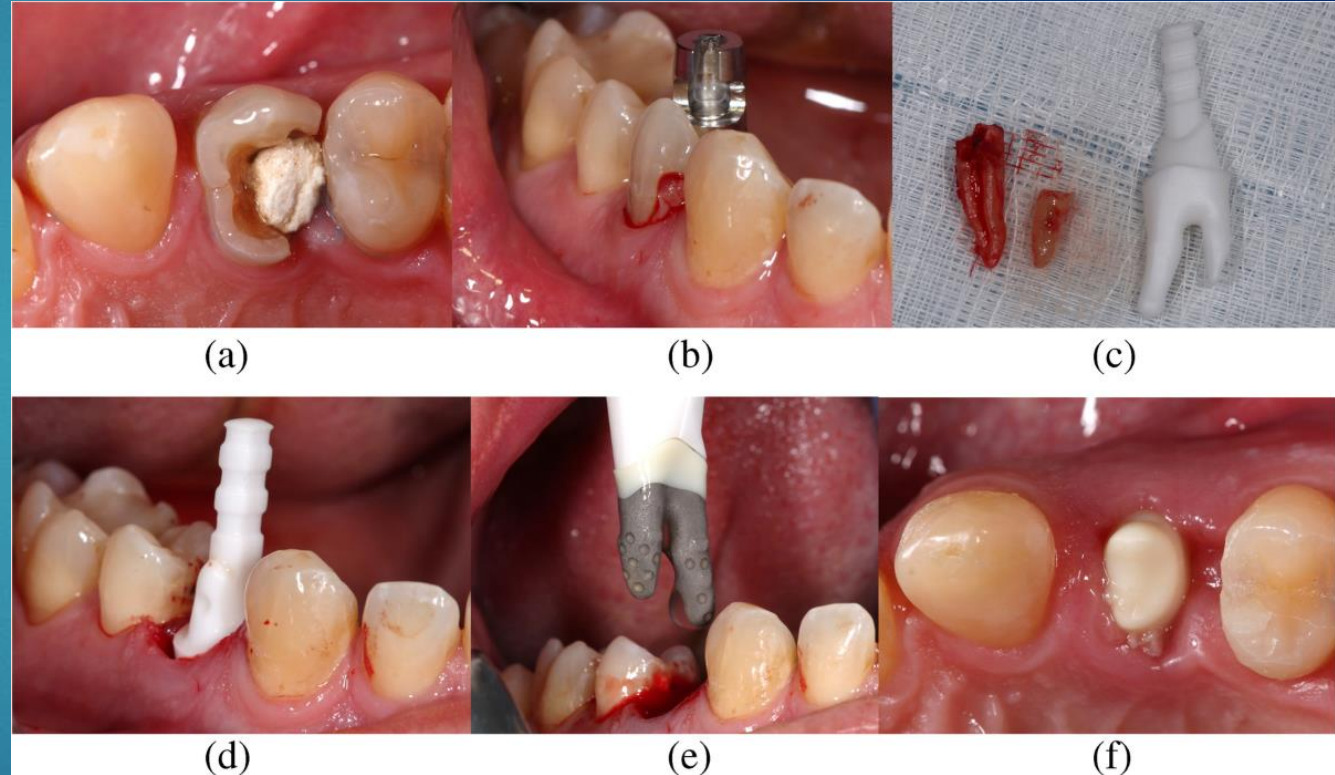
The problem with immediate implant placement when using **conventional-shaped** implant is the incongruence with the size and shape of extraction socket that may lead to the ingress of epithelial or connective tissue and failure of osseointegration, so a barrier membrane or bone augmentation would be placed in between to prevent that. **RAZIs** were fabricated to overcome this problem (**Chong CC, Jacqueline A Pffaf 2020**), the short to mid-term survival rate is 92-98% after 1-5 years in function making them good alternative to titanium implants. surface modifications have been made to improve retention to bone and enhance osseointegration including:

1. **Microretention**: acid etching and sandblasting to increase bone-implant contact area.
2. **Macroretention**: standardized protrusion bulbs at the mesial and distal aspects of the implant interdental space.
3. **0.1-0.5 reduction** from the buccal surface of the implant to decrease the pressure on the buccal plate preventing fracture and bone resorption.

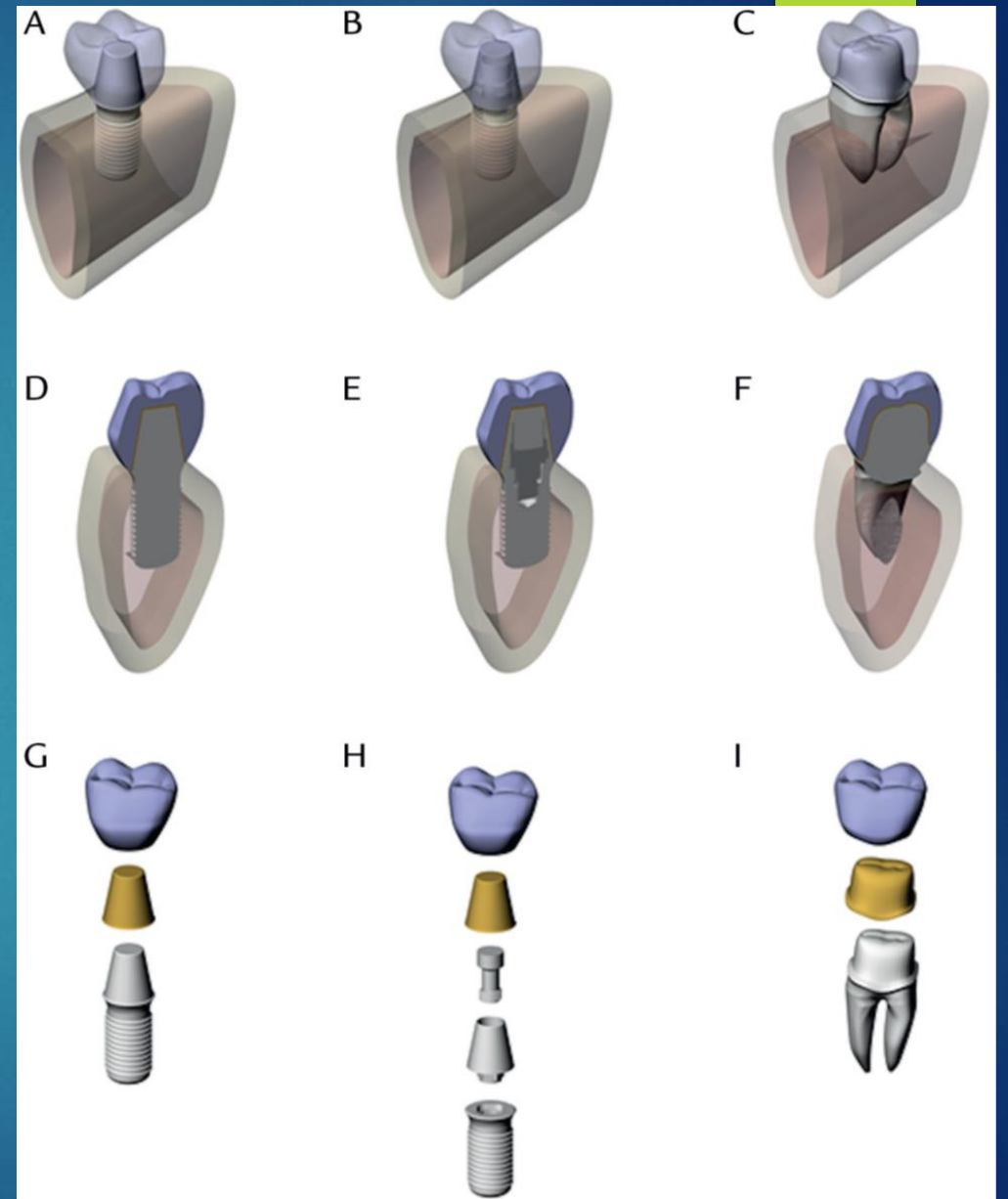


Techniques of manufacturing RAZIs:

1. **Immediate-delayed implantation:** after tooth extraction an iodine gauze was put in the socket, the root was scanned and an STL file transferred to a CAD-CAM machine for the milling of zirconia analog, this could take from 1-6 days after that the gauze was removed and the socket curetted and cleaned with sterile saline and the analog was finger pressed and fixed by gentle tapping with hammer and mallet.
2. **Immediate implantation:** A CBCT was taken to the unrestorable tooth and a scan for the surrounding soft and hard tissues, the obtained DICOM and STL files were superimposed on each other to have a 3D mesh then transferred to the CAD-CAM machine for the manufacturing of the RAZI. By that tooth extraction and analog insertion were done at the same time.



In a study evaluating the biomechanics of (one-piece, two- pieces and RAZ) implants in D1, D2, D3, D4 Misch classification bone type by finite element analysis, it has been found that **RAZIs show the lowest stress level** between the studied implants probably due to having **higher volume** and **contact area** resulting in more homogenous occlusal load distribution, whereas **two-piece implants** show the **highest stress level** especially at the abutment-fixture contact area (J.P.M Tribist, A.M.O Dal Piva etal 2024)



References:

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THANK YOU