Min 35 to 55 Dr Fuad Lec#23 part 3 By Aroob Al-Hyari

\*\*Manufacturing all ceramic :

1. Powder condensation
2. Heat processing (IPS empress)
3. Machine milling (CAD/CAM)
4. Slip casting technique

**Machine milling (CAD/CAM) –lithium disilicate**

The evolutions of CAD/CAM system machines for the production of machine inlay, onlay with years and crowns lead to the development of a new generation of ceramics that are machinery. These products are supplied as ceramic ingots into a various shades.

The prepared die/tooth is scanned and the resulted image is sent to the computer software that is connected to the milling machine to fabricate the final ceramic framework out of ready-made ingots.

Variation in technique itself (Direct VS indirect) milling and variations of framework design methods?

-intraoral picture sent to the computer, modification of design and sent to the milling machine to cut the whole restoration

- final impression , take an image, die cast, wax pattern,

Direct and indirect tech:

Direct: sintered porcelain, completely fired so that cutting produce the desired restoration immediately

Indirect : partially sintered porcalin, requires cutting then firing.

**Q: does CAD/CAM produce the whole crown or do we need to add on**?

In clinical application and recommendation for all ceramic restoration, we said we have glass based, alumina based, zirconia based ceramics. Regarding esthetics the best material is glasss , strength is zircon , and alumina based is in between regarding esthetic and mechanical properties.

\*Glass based : best esthetic its either :

- Feldspar (feldspathic)

-Lithium disilicate >>>used for the whole restoration Or the 2nd layer after using the alumina/ zirconia

So for alumina based/ zirconia we can get the whole restoration but with compromised esthetics, that’s why in fabricating a posterior bridge (esthetics not critical) CAD/CAM zirconia can do the job.

**\*\*Clinical applications and recommendations:**

1. For single crown: lithium disilcate , the dentist can choose between the more translucent and weaker glass ceramic (ex; IPS impress) and more opaque of zircon reinforced ceramic (ex; in ceram) many factors should be taken into consideration; tooth position, occlusion, presence of any parafunctional habits, amount and integrity of remaining tooth structure.
2. For Fixed partial denture: ( bridge)

Possibility of fabricating FPD in both anterior and posterior segments of oral cavity, however certain design aspects should be kept in mind to insure their longevity, both alumina and zricona can be used in fabrication of porcalin fused to metal

1. For onlay and inlay restoration:

Are indicated in partial rather than full coverage restoration is needed, in large interproximal restoration and teeth malposition, the dentist can go for glass or reinforced ceramic looking at amount of tooth structure loss and occlusion.

1. Implants and abutments:

Zirconia implants have been recently introduced into the market, when zircon based ceramic are used to fabricate implants abutments 2 points should be taken into consideration; wear behavior under loading as this will negatively affect the fit between the implants and abutment and screwing torque. “after we do the surgical procedure for implants and the fixture inside bone we wait 2-3 months for complete healing of implants/fixture, we open the gum and place gingival former (piece of metal that take the shape of surrounding gum like a screw) then we take the impression to make the restoration, we need to have an abutment to be fixed inside the implant/fixture it could be metal or ceramic. If we used ceramic we’ll face problems (wear by time, screwing with metal )

1. Laminated Veneers: most conservative indirect restoration replacing minimal amount of tooth structure in range of(0.3-0.5mm), veneers are mainly fabricated from glass ceramic – lithium disilcate-
2. Endodontic post: the use of glass fiber and zirocina post in restoring endodontically treated teeth is increasing for their improved esthetics qualities and radioluceny and decreased chance of corrosion and subsequent tissue allergies.

\*\* **Factors affecting success & longevity of all ceramic restoration:**

1. Proper clinical procedures: it’s of a paramount importance to follow the ideal guidelines of tooth preparation in order to obtain retention form, resistance form, tooth structure preservation and even distribution of stresses on restoration when its functionally loaded. The clinical steps here are basically the same as for any preparation in which traditional guidelines and those specific for all ceramic restorations should be followed; remember all ceramic needs a deep chamfer 0.8mm all around ,even and proper cutting and with 2 mm insical thickness of material and in molars 1.5mm.
2. Proper selection of material type: as it has been mentioned; if esthetics are critical go for glass, if strength of concern go for zirconia.
3. Marginal integrity:

Its defined as horizontal and vertical misfit between the margins of the restoration and the abutment, marginal discrepancy will lead to cement dissolution, micro leakage, blood accumulation, recurrent caries. More over marginal discrepancy will lead to variation in stress concentration and subsequent reduction of the restoration strength. It has been reported that maximum acceptable discrepancy to be 50 micron while other reported as 120 micron and the agreed on is 100 micron.

Metal try-in check list in sequence : retention, stability, occlusal clearance.

In metal or ceramic there’s a limit for the acceptable marginal gap, the metal we use is porous cheep one won’t get the fine margin unless we use the gold one.In ceramics especially CAD/CAM sometimes have a questionable margin because it machine made not hand made margin.

1. Crown thickness &core-veneer bond strength:

All ceramic restorations can be either monolayer –single layer/ bilayer

Monolayer are fabricated from glass- based ceramics with the advantage of being more esthetic, more translucent, require less tooth preparation, bonding adhesively to under layering tooth structure.

On the other hand bilayer ceramic restoration reinforced core and feldspathic ceramic mainly offer two main advantages:

-Mechanical advantage: retardation of crack propagation.

-Esthetic advantage : inherent translucent along with color characterization in veneered glass ceramic layers.

1. Design of restoration:

Success of FPD is achieved if good attention is brought to certain aspect in the design of: Pontic span & length and connectors; so during function the occlusal stresses are directed along the long access of FPD at the midpoint, which is the pontic area, generated compressive stresses of the connector occlusal at the marginal ridge area and tensile stresses gingivally, the resultant microcrack would weaken the core material and leading to fracture in the frame work.

Last 18 min

If our material that we use for all ceramic restoration GLASS base ceramic we need to do cementation and etching for fitting surface using HYDROFLUORIC acid about 73% OR 90%..

We do etching to remove part of glass particles to get irregularities , roughness to increase adhesion with resin materials .

If we use ALUMINA with no glass so we use air abrasion or machine that cause silane coating that enhance chemical rxn with resin .but with zirconia base we can use conventional acid base cement .

Using luting agent with acid base seating rxn ( zinc phosphate, zinc polycarboxylate , GI ) will cause surface defect in ceramic restoration, ,,but if its GLASS or ALUMINA we don’t use conventional acid base cement ..

Glass based ceramic …from adhesive luting agent ( increase retention , toughness ) need special surface treatment before cementation include etching by hydrofluoric acid 73% and coated with silane coupling agent upon etching specific ceramic surface texture is obtained ,,,this silanation process increase surface weldability of ceramic …

ALUMINA based ceramic surface can be either abraided by ( air borne particle or attacked by silica coating in order to enhanced the strength with adhesive cement used neither acid etch nor abrasive can be used for zirconia based cement (no glass and lack silica that resist etching ) and undergo phase transformation upon air abrasion …

Both adhesive and conventional leuting agent can be used for cement this type of ceramics …

NOTES :\_\_\_

We use H3PO4 so no foreign body will form and with 73% we ensure that byproduct result is washable and we get better retention ….

If we increase or decrease that % we don’t get such picture …

We don’t use HCL we have risk for patient .

We can put core ( first layer with alumina or zirconia ) and we use conventional ceramic for better esthetic …

SCA>>for bonding between resin and porcelain

All ceramic very expensive ..

Total etch : remove smear layer better bond to teeth but more post op sensitivity ..

Self etch : smear layer present , less bond to teeth , less post op sensitivity with less steps to save time …