Dental Crown

Presented by

Dr. Saraa Almallah
Dental crown

is a fixed extra coronal restoration that covers the outer surfaces of the clinical crown. It should restore the morphology, contours and the function of the same tooth and should protect the remaining tooth structure.
Types of crown

- Extra-coronal
  - Full coverage prosthesis
  - Partial coverage prosthesis

- Intra-coronal
  - Inlay
  - Onlay
  - Overlay

- Intra-radicular
  - Post crown
  - Endocrown
Definition of terms:

- Full veneer crown: (5 surfaces)
- It is an *extra coronal restoration* that involves all the surfaces of the clinical crown of a tooth. Its crown is full metal cast having and all its surfaces veneered with ceramic.
Definition of terms:

Partial veneer crown: (Less than 5 surfaces)

It is *extra coronal restoration* that usually includes except one surface of a tooth.
Definition of terms:

Three quarter crown partial veneer:

It is partial coverage extra coronal restoration involving all the tooth surfaces leaving the labial or buccal surface intact.

It is indicated on anterior teeth, premolars, and molars.
**Definition of terms:**

- **Reverse three quarter crown:**

  It is partial coverage *extra coronal restoration* that is modified 3/4 preparation where the *lingual surface is left intact*, used with severe lingual inclination of lower molars.
Definition of terms:

- One half crown:

It is a partial coverage extra coronal restoration involving one proximal surface, half buccal, lingual, and occlusal surfaces.
Definition of terms:
- 7/8 crown:

It is a partial coverage extra coronal restoration covering all surfaces of the tooth except the mesiobuccal cusp of upper first molar.
Intra coronal restoration
Inlay

An Inlay is a restoration, which has been constructed out of the mouth from the gold, porcelain or composite and then cemented into the prepared cavity of the tooth.
An onlay is essentially an inlay that covers one or more cusp and entire occlusal surface of the tooth.
Type of Inlay and Onlay

A. Gold

Historically, gold was the material of choice for inlays and onlays. The accuracy and malleability of gold made it an ideal material to restore lost tooth structure and protect weakened cusps destroyed by caries and trauma.
Type of Inlay and Onlay

A. Gold

its use has declined over recent years but is still used in areas of the mouth where appearance is not important.
Type of Inlay and Onlay

B. Tooth colored restoration

Ceramic and composite-based materials are regularly used, as an alternative to gold in restoring broken down teeth.
Advantages (for both Inlay and Onlay)

1. Extremely strong and durable.
2. Can give the restored tooth a natural, aesthetic appearance.
3. Better physical properties.
Disadvantages (for both Inlay and Onlay)

1. Higher cost compared to a restoration, due to the need for a dental laboratory.

2. Lengthier process as two appointment required.

3. Repair is difficult.
Intra-radicular
Definition of post and core:

A **post and core** is a type of **dental restoration** required where there is an inadequate amount of sound tooth tissue remaining to retain a conventional crown. A post is cemented into a prepared **root canal**, which retains a core restoration, which retains the final crown (Intra radicular retention)
Classification of the post and core systems:

I. According to the material:

(A) All metallic: the post and core are constructed from metal only.

(B) Combination of metal and non-metal. The post constructed from metal and the core from non-metal such composite or reinforced glass ionomer.
Classification of the post and core systems:

I. According to the material:

(c) All non-metallic: recently introduced, such as zirconium oxide ceramics posts, and fiber post and the core from non-metal such composite or reinforced glass ionomer.
Classification of the post and core systems:

II. According to method of construction:

1. Custom made cast posts: it is cast from extra hard alloys such as type IV specified gold alloys or cobalt chromium alloys and also from zirconia fabricated with CAD/CAM technology.
Classification of the post and core systems:

II. According to method of construction:

I. Prefabricated posts: the prefabricated (ready-made) posts are supplied in different sizes, designed and shapes.
Cast Metal Post.. lab protocol(720P_HD).mp4
ANY QUESTIONS?
Dental Bridge

Presented by
Dr. Saraa Almallah
Bridge/ Fixed Partial Denture-

A restoration or replacement which is attached by a cementing medium to natural teeth, roots or implants.
Indications of Fpd

- Short span edentulous arches.
- Presence of sound teeth that can offer sufficient support adjacent to the edentulous space.
- Patient’s preference
- Mentally compromised and physically handicapped patients who cannot maintain the removable prosthesis.
Contra-indications of fpd

- Large amount of bone loss as in trauma.
- Very young patients where teeth have large pulp chambers.
- Presence of periodontally compromised abutments.
- Long span edentulous spaces.
Types of bridge

- Fixed fixed partial denture
- Fixed movable partial denture
- Cantilever
- Spring cantilever
Components of bridge

1- Abutment
2- retainer
3. Pontic
4- connector
Abutment

a tooth or portion of a tooth that used for the support and/or retain of a fixed bridge or part of the bridge, to which retainer is connected (cemented).
All the forces that would normally be absorbed by the missing tooth are transmitted, through the pontic, connectors, & retainers to abutment teeth.

Abutment teeth must withstand forces normally directed to the missing teeth, in addition to those usually applied to the abutments, therefore, the choice of abutment is important because it has to withstand both the forces acting on it and on the pontic.
Classification Or Types of Abutment

1. Pier Abutment
2. Distant Abutment
3. Cantilever Abutment
4. Addional Abutment
5. Implant Abutment
Pier Abutment

It is a natural tooth located between terminal abutments that serve to support a fixed or removable prosthesis.
Additional abutment

It is the abutment which is used in addition to the primary abutments in case of a long edentulous span, or if the primary abutment is weak.
Distant Abutment

The posterior or distal abutment which retain and support the lone pontic in anterior region. Usually used in diastema cases.
Cantilever Abutment

The abutments which retain and support the pontic only on one side.
Can be one or more in number
Implant Abutment
CRITERIA (FACTORS) FOR SELECTION OF AN ABUTMENT

CRITERIA

TOOTH
- LOCATION
- POSITION
- FORM
- CONDITION

ROOT
- CROWN ROOT RATIO
- ROOT CONFIGURATION

GINGIVO-PERIODONTAL COMPLEX
- GINGIVA
- PERIODONTIUM
CROWN TO ROOT RATIO

This ratio is a measure of the length of the tooth occlusal to the alveolar crest of the bone compared with the length of the root embedded in the bone. The optimum crown to root ratio is 2:3, but the minimal ratio required is 1:1.
Roots that are broader labio-lingually rather than mesio-distally are preferred to roots which are round in cross section. Multirooted posterior teeth with widely separated roots offer better support than roots that converge, fuse or have a conical configuration.
Periodontal ligament area—(Ante's law)—combined pericemental area of all abutment teeth supporting a fixed dental prosthesis should be equal to or greater in pericemental area than the tooth or teeth to be replaced.

The combined root surface area of the second premolar and the second molar ($A_{2p} + A_{2m}$) is greater than that of the first molar being replaced ($A_{1m}$).
RETAINERS

DR. SARAA ALMALLAH
RETAINERS

That component of an FPD which takes support from the abutment tooth and provides retention to the prosthesis.
REQUIREMENTS OF RETAINER

1. Biocompatible

2. Withstand the masticatory forces

3. Restore the anatomy of the tooth

4. Pulp consideration
REQUIREMENTS OF RETAINER

5. Strong enough to resist deformation under functional stress

6. Esthetically acceptable

7. Maintain oral hygiene
CRITERIA FOR SELECTION OF RETAINERS

1. Degree of retention required
2. Surface area of the abutment
3. Periodontal condition
4. Condition of the abutment teeth
5. Preservation of tooth structure
6. Relation with the opposing teeth
7. Material used for bridge construction
8. Alignment of teeth
1- Degree of retention required

It represent the most important criterion,

The factors that affect retention are:

A. Length of the span:

Longer the span the greater the stress on the retainers, so the components of the bridge must be stronger

B. Type of the bridge:

Stronger retainers are required for fixed-fixed bridge than fixed-movable bridge to withstand the stress on the cementing media.
C. Tooth or teeth to be replaced

Size and position of pontic have a direct effect on type of retainer, for example: replacement of molar impart great stress to abutment than lower central.

D. Habits of the patient:

Bruxism patient should be given thicker and stronger retainer than normal because of their excessive clenching
2- Surface area of the abutment tooth

Surface area of the abutment tooth, the surface area of lower molar is greater than that of a canine so the use of molar as abutment will increase the retention.

3- Periodontal condition

in cases of gingival recession the finish line should be placed supragingivally to minimize gingival irritation, but this will reduce the surface area of the abutment tooth and decrease the retention.
4- Condition of the abutment

partial veneers crowns are indicated for non carious abutments, while full veneer crowns used for large carious abutments. Endodontically treated teeth requires post and core.

5- Preservation of tooth structure:
Partial > full veneer > all ceramic
6- Relation with the opposing teeth.

7- Material used for bridge construction.

8- Alignment of teeth.
CLASSIFICATION OF RETAINERS

Extra coronal
- full coverage
  - complete metal
  - all ceramic zirconia bridge
  - metal fused to ceramic
- partial coverage
- resin bonded retainers

Intra coronal
- Inlay
- onlay

Intra-Radicular retainers
EXTRA-CORONAL RETAINERS

Full coverage restorations

These are restorations used to restore the **all surfaces of the clinical crown**. And are classified according to the material used in their construction, as:

1. Metal crowns
2. Non-metal crowns
3. Combination of both of the two above.
METAL CROWN

It is an artificial metallic restoration used to cover all the surfaces of the clinical crown.

It is made *only* from metal, e.g. Gold.
Metal crowns

• **Indications**

1. As single crown or as a bridge (retainer for FPD).
2. Only for posterior teeth (where there is a severe occlusal stress).
3. In patient with high caries index.
4. For an endodontically treated tooth.
5. For malalignment tooth/or teeth.
6. For teeth with a short occluso-gingival height.
7. For a badly broken clinical crown.
8. In a long span bridge.
1. In case of anterior teeth, for esthetic reasons.

2. In a situation where another conservative preparation can be use (e.g. Partial coverage).

4. When caries extend gingivally, as that the finish line cannot be made.
Advantages of Metal Crowns:

- Great resistance form.
- Great retention.
- High strength.
- Good protection for a tooth to be restored.
- Ideal restorations for teeth with developmental defects.
Metal crowns

- Disadvantages

- Bad esthetics (especially for anterior teeth).
- Pulp vitality can not be detected.
- Extensive amount of tooth reduction.
COMBINED CROWNS

Known as:

- Porcelain Fused to Metal crowns (PFM), or
- Metal ceramic crowns.
Metal ceramic crowns • Indications

1. On teeth require esthetic.

2. In case of extensive tooth destruction as a result of caries, trauma, or existing previous restorations.

3. In case of an endodontically treated tooth

4. When there is a repeated failure of PJC.
Metal ceramic crowns

- **Contraindications**

1. In patient with active caries or untreated periodontal disease.

2. In young patient (under 18) with large pulp chamber because of the high risk of pulp exposure.

3. Where a more conservative restoration can be made.
Metal ceramic crowns

- Advantages

1. Have the strength of cast metal crowns with the esthetic of the all ceramic crowns

2. Have good retention.
Metal ceramic crowns

- Disadvantages

1. Their preparation requires more tooth reduction to provide sufficient space for the restorative materials.

2. Their facial margins for anterior teeth, is often placed subgingivally which increase the risk for periodontal disease.

3. The laboratory casts are expensive.
ALL CERAMIC ZIRCONIA CROWN
Zirconia crown • Indications

1. For anterior teeth (especially incisors).
2. For severely discolored anterior teeth.
3. Over an existing post and core substructure.

Zirconia crown • Contraindications

1. Parafunctional habits
2. In case of tooth with short clinical crown (no enough tooth structure to support the porcelain).
3. In case of edge to edge or overbite occlusion.
Zirconia crown • Advantages

1. Have the best cosmetic effect of all dental restorations.
2. High strength
3. biocompatible
4. excellent insulation

Zirconia crown • Disadvantage

1. Expensive as it requires CAD/CAM system
2. Bond between the ceramic veneer and the zirconia framework is the weakest component of the layered structure.
pontic

Presented by
Dr. Saraa Almallah
What is pontics?

Pontics are the artificial teeth of a partial fixed dental prosthesis (FDP) that replace missing natural teeth, restoring function and appearance.
What is pontics?

The occlusal surface

The occlusal surface of the pontic should resemble the occlusal surface of the tooth it replaces. Otherwise it will not serve the same occlusal functions.
The principles guiding the design of the pontic are:

A. Cleansability
B. Appearance
C. Strength
A. Cleansability

All surfaces of the pontic especially the ridge surface, should be made as cleansable as possible.

Dental Bridge

Plaque and bacteria can accumulate here
A. Cleansability

This means that they must be smooth and highly polished or glazed, and should not contain any junctions between different materials.
A. Cleansability

In a metal-ceramic pontic the junction between the two materials should be well away from the ridge surface of the pontic.
B. Appearance

Where the full length of the pontic is visible. It must look as tooth-like as possible.
C. Strength

All pontics should be designed to withstand occlusal forces. The longer the span, the greater the occlusal-gingival thickness of the pontic should be.
C. Strength

Metal-ceramic pontics are stiffer and withstand occlusal forces better if they are made fairly thick leaving only a line of metal visible on the lingual surface.
Classification of pontic design

Pontic designs are classified (based on the shape of the gingival side of the pontic) into two general groups:

I. Non-mucosal contact

II. Mucosal contact
Classification of pontic design

1) Non-mucosal contact:
   a. Sanitary (hygienic)
   b. Modified sanitary (hygienic)
Classification of pontic design

II. Mucosal contact:

a. Ridge lap
b. Modified ridge lap
c. Conical
d. Ovate
The term **hygienic** is used to describe pontics that have no contact with the edentulous ridge.

This pontic design is frequently called a “sanitary pontic”
a. Hygienic (Sanitary)

This hygienic design permits easier plaque control by allowing cleaning devices to be passed under the pontic.

Fig 25-13 Floss passes over a smooth, round surface (a) more easily than over a flat surface and sharp angles (b).
b. Modified Hygienic (Sanitary)

A modified version of the sanitary pontic has been developed. Its gingival portion is shaped like an archway between the retainers. This geometry permits increased connector size and access for cleaning is good.
b. Modified Hygienic (Sanitary)

Its **disadvantages** include entrapment of food particles, which may lead to tongue habits that may annoy the patient. It is the least “toothlike” design and is therefore reserved for teeth seldom displayed during function (i.e., the mandibular molars).

**ARC-FIXED OR PEREL**
b. Modified Hygienic (Sanitary)

Fig 25-14 Facial view of hygienic, or sanitary, pontics: (a) conventional
Classification of pontic design

II. Mucosal contact:
   a. Ridge lap
   b. Modified ridge lap
   c. Conical
   d. Ovate

![Diagram of pontic designs](image)
A. Saddle (Ridge lap)

The saddle pontic has a concave fitting surface that overlaps the residual ridge buccolingually, it looks most like a tooth, replacing all the contours of the missing tooth.
A. Saddle (Ridge lap)

Saddle or ridge lap designs should be avoided because the concave gingival surface of the pontic is not accessible to cleaning with dental floss, which will lead to plaque accumulation and gingival inflammation.

**FIGURE 20-14** A, Cross-sectional view of ridge-lap pontic. B, The tissue surface is inaccessible to cleaning devices.
B. Modified ridge lap

The modified ridge lap pontic combines the best features of the hygienic and saddle pontic designs, combining esthetics with easy cleaning.
B. Modified ridge lap

The modified ridge lap design overlaps the residual ridge on the facial (to achieve the appearance of a tooth emerging from the gingiva) but remains clear of the ridge on the lingual.

Modified ridge lap pontics: (a) maxillary, (b) mandibular.
B. Modified ridge lap

The lingual surface should have a slight deflective contour to prevent food impaction and minimize plaque accumulation.
B. Modified ridge lap

Whenever possible, the contour of the tissue-contacting area of the pontic should be convex.

**FIGURE 20-17** Three-unit partial fixed dental prosthesis replacing the maxillary lateral incisor. **A,** To facilitate plaque control, the lingual surface is made convex. **B,** The facial surface is shaped to simulate the missing tooth.
B. Modified ridge lap

This design is commonly used in the esthetic zone for both maxillary and mandibular fixed dental prosthesis.
C. Conical

Often called egg-shaped, bullet-shaped, or heart-shaped. The conical pontic is rounded and cleanable, but the tip is small in relation to the overall size of the pontic. It is well suited for use on a thin mandibular ridge.
C. Conical

However, when used with a broad, flat ridge, the resulting large triangular embrasure spaces around the tissue contact have a tendency to collect debris. Its use is limited to replacement of teeth over thin ridges in areas that are not highly visible.
D. Ovate

The ovate pontic is the most esthetically appealing pontic design. Its convex tissue surface resides in a soft tissue depression or hollow in the residual ridge.
D. Ovate

The ovate pontic is the most esthetically appealing pontic design. Its convex tissue surface resides in a **soft tissue depression** or hollow in the residual ridge.
Socket-preservation techniques should be performed at the time of extraction to create the tissue recess from which the ovate pontic form will emerge.
D. Ovate

When an adequate volume of ridge tissue is established, a socket depression is sculpted into the ridge with surgical diamonds or electrosurgery.
The concavity can be created by placement of a provisional fixed partial denture with the pontic extending one-quarter of the way into the socket immediately after extraction of the tooth.
Advantages:

1. Pleasing appearance
2. High strength.
3. Its emergence from the ridge appears identical to that of a natural tooth.
4. Its eruption form is not susceptible to food impaction.
Disadvantages:

1) Meticulous oral hygiene is necessary to prevent tissue inflammation resulting from the large area of tissue contact.
2) The need for surgical tissue management
3) The high cost.
CONNECTORS IN FIXED PARTIAL DENTURES
Connector is defined as, the portion of a fixed partial denture that unites the retainer(s) and pontic(s).
CONNECTOR DESIGN

- Incisocervically, hygiene is impeded, and over time, periodontal failure will occur, if the connector is too large.

- Faciolingually, the tissue surface of connectors is curved and highly polished, to facilitate cleansing.

- Buccolinguval cross-section, most connectors have a somewhat elliptical shape.
DIMENSIONS OF A CONNECTOR

- The minimal recommended connector cross section area is 12-16 mm².

- The recommend occlusogingival (vertical height) height of a connector is 3 to 4 mm.
TYPES OF CONNECTORS

CONNECTORS

RIGID CONNECTORS
- Cast Connectors
- Soldered Connectors
- Loop Connectors

NON-RIGID
- Tenon-mortise
- Split Connectors
- Cross-pin & wing
Rigid connector

- Rigid connector is defined as a cast, soldered, or fused union between the retainer(s) and pontic(s) or splinted crowns.

- Rigid connections in metal can be made by **casting, soldering, or welding**.

- Rigid connectors must be shaped and incorporated into the wax pattern after the individual retainers and pontics have been completed to final contour.
1. CAST CONNECTORS
CAST CONNECTORS

Advantage:
- Cast connectors are convenient and minimize the number of steps involved in the laboratory fabrication.

Disadvantage:
- Access to the proximal margin is impeded, and the pattern cannot be held proximally during removal from the die.
- One-piece castings often appear to simplify fabrication but tend to create more problems than do soldered connectors, especially as pattern complexity increases.
A solder is defined as a fusible metal alloy, distinguishable between the two uniting metals, used to unite the edges or surfaces of two pieces of metal.

Soldered connectors involve the use of an intermediate metal alloy whose melting temperature is lower than that of the parent metal.
Connectors to be soldered are waxed to final shape and then sectioned with a thin ribbon saw. The surfaces to be joined should be flat and parallel.
SOLDERING GAP WIDTH

- An even **soldering gap** of about **0.25mm** is recommended.

- As gap width increases soldering accuracy decreases.

- Extremely small gap width can prevent proper solder flow and lead to an incomplete or weak joint.
SOLDERING FLUX

FLUX

Any substance applied to surfaces to be joined to clean and free them from oxides and promote union.

- For noble metals, the flux used is composed of borax glass (55%), boric acid (35%) and silica (10%).

- The composition of flux for base metal alloys is fluoride based.
ANTIFLUX

Antifluxes are materials that prevent or confine solder attachment or flow.

They prevent flow of excess solder into undesirable areas. Graphite (pencil) is used as antiflux, but it evaporates at high temperatures. Iron oxide (rouge) in chloroform can also be used.
HEAT SOURCE SOLDERING

1. **Torch**: A gas–air or gas–oxygen flame torch as described for casting is most commonly used for soldering. As for casting, the reducing part of the flame should be used to prevent oxidation.

![Diagram of a torch showing zones and approximate ratios in a properly adjusted flame.](insert image)

**Zones**:
1. Mixing zone
2. Combustion zone
3. Reducing zone
4. Oxidizing zone
2. OVEN SOLDERING

- This is performed in a furnace under **vacuum or air**. The soldering index along with the castings and the solder is heated in a furnace up to the melting temperature of the solder.

- Although a strong joint is obtained, the melting of solder cannot be observed and the longer the solder is molten, it can dissolve the parent metal producing a weak joint.
3. Laser welding

This has demonstrated joints with high strength and reduced corrosion compared to conventional torch soldering. Fatigue failure has been a problem. It may be more suitable to solder titanium.
PRECERAMIC SOLDERING

Soldering metal-ceramic fixed partial dentures performed before ceramic application.

Advantages:
- Trial of the soldered prosthesis can be done in an unglazed state.
- Any adjustments required on porcelain can be made.

Disadvantages:
- Contouring proximal embrasures is difficult.
POSTCERAMIC SOLDERING

Soldering metal-ceramic fixed partial dentures performed after ceramic application.

Advantages:
- Proximal surface can be shaped properly.

Disadvantage:
- Adjustments on porcelain not possible after soldering, as it has to be finished completely before the soldering procedure.
LOOP CONNECTORS

- The connector consists of a loop on the lingual aspect of the prosthesis that connects adjacent retainers and/or pontics.

- It is most often indicated in replacing missing maxillary central incisor when a diastema is desired. Not used with mandibular replacements as the connector can cause tongue interference.
LOOP CONNECTORS
NON – RIGID CONNECTORS
**NONRIGID CONNECTOR:** Any connector that permits limited movement between otherwise independent members of a fixed partial denture. (GPT – 9)

**TYPES**
- Tenon-mortise connector
- Split pontic connector
- Cross-pin and wing connector
**INDICATIONS**

- When it is not possible to prepare two abutments for a partial FDP with a common path of placement.

- Long span bridges, which can distort due to shrinkage and pull of porcelain on thin sections of framework and thus, affect the fitting of the prosthesis on the teeth.
The existence of Pier abutment, which promote a fulcrum-like-situation that can cause the weakest of the terminal abutments to fail and may cause intrusion of the pier abutment.
CONTRAINDICATIONS:

- If the abutment presents significant mobility.

- If the span between the abutments is longer than one tooth, because the stresses transferred to the abutment tooth under soldered retainer would be destructive.

- If the posterior retainer and pontic are opposed by a removable partial denture or an edentulous ridge while the two anterior retainers are opposed by natural dentition.

- Pulp size and clinical crown height can be limiting factors in the design of nonrigid connectors.
The tenon (male component) is attached to the pontic and the mortise (female component) is attached to the retainer. Their alignment must be parallel to the path of placement.

The mortise is usually placed on the distal aspect of the anterior retainer. Accurate alignment of the dovetail or cylindrically shaped mortise is crucial; it must parallel the path of placement of the distal retainer.
TENON-MORTISE CONNECTOR
SPLIT PONTIC

- Split pontic is **only indicated in pier abutment** cases. It is an attachment that is placed entirely within the pontic.

- Mesial segment which is cemented first had the distal shoe that is gingival portion of pontic.

- Distal segment covers the mesiogingival part of pontic When the distal retainer is cemented.
CROSS-PIN AND WING

- The cross pin and wing are the working elements of a two-piece pontic system that allows two segments to be rigidly fixed after the retainers have been cemented on their respective abutment preparations.

- The wing should parallel the path of insertion of the mesial abutment. The wing along with the distal retainer is termed retainer wing component.
CROSS-PIN AND WING

The pontic is attached to the mesial retainer and is designed to fit the wing component. The pontic along with the mesial retainer is termed as the retainer pontic component.
THANK YOU
Provisional restoration in fixed prosthodontic

Presented by
Dr. Saraa Almallah
After the preparation of a tooth for a fixed prosthodontics, there is a period of time (usually a few days) that the patient must wait until the laboratory procedures involved in constructing the restoration are completed. During this time, a provisional restoration is placed over the prepared tooth.
Provisional restorations are usually constructed out of:

a. Acrylic

b. Composite
Functions

Esthetics - temporary restorations restore the tooth to its original shape after preparation. This is especially important in the anterior teeth.
Functions

Esthetics - The acrylic provisional can be a "testing ground" for esthetic changes such as tooth shape and length. The temporary can be easily altered until the patient is satisfied with the esthetics. The final restoration can be made to match the provisional.
Functions

**Function** - the provisional must be constructed in such a manner that the patient can chew on it with comfort. So it must be thick enough to withstand occlusal forces.
Functions

Sensitivity - The acrylic temporary must cover all prepared tooth surfaces to prevent tooth sensitivity. Discomfort and pulpal damage can occur if prepared surfaces of vital teeth are left uncovered.
Functions

Drifting - After preparation, a tooth no longer has proximal and occlusal contacts. Without restoring these, the prepped tooth may drift out of position. This can occur rather rapidly (within days to weeks).
Functions

Drifting - A properly contoured provisional restoration restores both proximal and occlusal contacts and maintains the original position of the tooth. If a tooth is allowed to drift out of position, the final restoration will not fit properly.
Functions

Tissue Health:

a. Temporary needs to restore proper contours.
Functions

Tissue Health:

b. Without a temporary, there may be tissue overgrowth over the finish line of the preparation.
Functions

Tissue Health:
c. If the temporary is over contoured, there may be gingival irritation.
Functions

Diagnostics - If you are making a change in the occlusion, the provisional restoration is your trial run. Changes are easily made in the temporary stage. Once final contours are obtained, the temporary can be duplicated and sent to the laboratory as a guide for construction of the final restoration.
Types of provisional restorations:

Provisional *restorations* can be categorized according to method of construction into two main methods:

1. Custom temporaries

2. Prefabricated temporaries
Types of provisional restorations:

Prefabricated temporaries: these are preformed single unit restorations only (crowns) that can be modified to fit a prepared tooth. In most cases these require relining with an acrylic material.
Types of provisional restorations:

**Custom temporaries:** - those that are made with a index derived from the original tooth or a modified diagnostic cast. Custom temporaries can be constructed in three different manners:
Types of provisional restorations:

Custom temporaries:

1) Direct: these are constructed with an index lined with provisional material that is placed directly on the prepared tooth.
Types of provisional restorations:

Custom temporaries:

2) **Indirect:** these are constructed by placing the filled index over a model of the prepared tooth, thus the provisional is constructed out of the patient's mouth.
Types of provisional restorations:

Custom temporaries:

3) Indirect-Direct: these are made by forming a temporary in an indirect manner and then relining this directly in the patients mouth.
Prefabricated temporaries restorations:

Polycarbonate Crowns:

These are highly esthetic and available in incisors, canines and bicuspids. There is a range of sizes for each tooth form.
Prefabricated temporaries restorations:

Polycarbonate Crowns:
Polycarbonate crowns for posterior teeth are also available, but are packaged separately. They generally are more difficult to use due to variations in tooth size and shape.
Polycarbonate Temporary Crown(720P_HD).mp4
Polycarbonate Crowns

Techniques

Select a polycarbonate crown to fit the prepared tooth.
Polycarbonate Crowns

Techniques

The interproximal distance of the area to be restored may be measured with calipers and then used to select the proper size polycarbonate crown.
Polycarbonate Crowns

Techniques

Seat the selected polycarbonate crown over the prepared tooth. Note that it will have to be trimmed at the gingival margins to seat fully on the tooth and have the occlusal plane correspond with adjacent teeth by using an acrylic bur or white stone bur.
Polycarbonate Crowns

Techniques

Be sure the margins of the polycarbonate crown cover the finish line of the prepared tooth. While adjusting the crown, it's helpful to keep the "handle" attached to the buccal cusp tip.
Polycarbonate Crowns

Techniques

In order to achieve an accurate fit, the polycarbonate crown must be relined with acrylic. Before doing this, lubricate the prepared tooth and surrounding area with Vaseline or similar lubricant. In a clinical situation, the patient's saliva is an adequate lubricant.
Polycarbonate Crowns

Techniques

Mix some acrylic in a dappen dish and fill the polycarbonate crown.
Polycarbonate Crowns

Techniques

Seat the crown fully over the prepared tooth. Excess material will be expressed out of the margin area.
Polycarbonate Crowns

Techniques

Immediately remove the excess with an explorer tip. If you wait too long, the acrylic will get rubbery and removal of excess will cause acrylic to be pulled out of the critical margin area.
Polycarbonate Crowns

Techniques

Be sure to pull the crown off and on once or twice during the setting of the acrylic to prevent locking on of the crown.
Polycarbonate Crowns

Techniques

After the acrylic has hardened, trim to a precise marginal fit. And finish the margins with a white stone burr.
Polycarbonate Crowns

Techniques

By using articulating paper adjust the occlusal contacts with a round bur until the occlusion is correct.
Polycarbonate Crowns

Techniques

Polish the entire restoration using paste and a rubber cup.

Completed crown showing restored tooth.
Prefabricated temporaries restorations:

Ion Crown Formers

These are shells made of cellulose acetate and are available in all tooth forms and sizes. These shells are lined with acrylic resin. After the acrylic resin has polymerized, the cellulose shell is peeled away from the crown.
Prefabricated temporaries restorations:

Tin Silver/ Aluminum Crowns

Are available for posterior teeth. This alloy is soft and the margin of the crown can be flexed prior to seating with a dental plair. This produces a close marginal fit after the shell is trimmed with a bur.
Prefabricated temporaries restorations:

Tin Silver/ Aluminum Crowns

This produces a close marginal fit after the shell is trimmed with a bur. These should also be lined with acrylic resin to provide good internal adaptation and retention of the temporary.
Prefabricated temporaries restorations:

Tin Silver/ Aluminum Crowns

Crowns are available in the anatomic form as shown here, or in a cylindrical form that requires extensive occlusal contouring.
Custom Temporaries

Custom temporaries can be made either in a direct, indirect or indirect-direct manners, but all have a custom index from either the patient's original tooth, or from the diagnostic cast.

Direct  Indirect  Indirect-direct
Custom Temporaries

I. Indirect Provisional Fixed Partial Denture

The technique involves fabrication of the provisional restoration outside the mouth.
Custom Temporaries

I. Indirect Provisional Fixed Partial Denture

Procedure:

1. On the diagnostic cast, place a selected acrylic tooth on the area of the missing tooth, and seal it with wax.
Custom Temporaries

I. Indirect Provisional Fixed Partial Denture

Procedure:

2. A silicone putty index is made involving at least one tooth each beyond the abutment teeth.
Custom Temporaries

I. Indirect Provisional Fixed Partial Denture

Procedure:

2. a silicone putty index is made involving at least one tooth each beyond the abutment teeth.
Custom Temporaries

I. Indirect Provisional Fixed Partial Denture

Procedure:

3. Prepare the patient’s teeth in the usual manner.

4. Make impression of the prepared teeth and pour a cast.
Custom Temporaries

I. Indirect Provisional Fixed Partial Denture

Procedure:

5. Lubricate the cast with a petroleum jelly, mix the provisional restorative material, and place it in the tissue surface of the index and seat it on the cast.
Custom Temporaries

I. Indirect Provisional Fixed Partial Denture

Procedure:

6. Try in the preformed restoration for its fit on the cast and intraorally.
Custom Temporaries

I. Indirect Provisional Fixed Partial Denture

Indirect technique
Custom Temporaries

I. Indirect Provisional Fixed Partial Denture

Advantages

1) There is no contact of free monomer with the prepared tooth or gingiva, which might cause sensitization.

2) The prepared tooth is not subjected to heat created from the exothermic reaction of resin which might cause irreversible pulp damage.
Custom Temporaries

I. Indirect Provisional Fixed Partial Denture

Advantages

3) The marginal fit of indirectly constructed restoration is better due to its complete polymerization undisturbed on the stone cast.
Custom Temporaries

I. Indirect Provisional Fixed Partial Denture

Disadvantages

1) Increased number of intermediate steps.

2) Possible damage of diagnostic casts
Custom Temporaries

II. Indirect –Direct Provisional Fixed Partial Denture

Procedure:

Pour an accurate diagnostic cast from an impression of the unprepared teeth.

1) Wax a pontic into the missing teeth of the study cast.
Custom Temporaries

II. Indirect - Direct Provisional Fixed Partial Denture

Procedure:

2) Lubricate the modified diagnostic cast, and make a silicone putty index is made involving at least one tooth each beyond the future abutment teeth.
Custom Temporaries

II. Indirect - Direct Provisional Fixed Partial Denture

Procedure:

3) Remove the acrylic tooth and prepare the abutments on mounted diagnostic casts. (The diagnostic cast preparations should be more conservative than the eventual tooth.)
Custom Temporaries

II. Indirect –Direct Provisional Fixed Partial Denture

Procedure:

4) Lubricate the prepared diagnostic cast with a petroleum jelly, mix the provisional restorative material, and place it in the tissue surface of the index and reseat it on the prepared diagnostic casts.
Custom Temporaries

II. Indirect –Direct Provisional Fixed Partial Denture

Procedure:

6) Prepare the patient’s teeth in the usual manner.
Custom Temporaries

II. Indirect - Direct Provisional Fixed Partial Denture

Procedure:

5) After the acrylic resin has polymerized, finish the restoration.
Custom Temporaries

II. Indirect - Direct Provisional Fixed Partial Denture

Procedure:

7) Try in the preformed restoration in the patient's mouth
Custom Temporaries

II. Indirect - Direct Provisional Fixed Partial Denture

Procedure:

8) Reline the temporary restoration to perfect the internal fit.
Custom Temporaries

II. Indirect - Direct Provisional Fixed Partial Denture

Procedure:

9) Finish, polish, and cement the restoration.
Custom Temporaries

II. Indirect – Direct Provisional Fixed Partial Denture

Direct indirect technique
Advantages

1) Chair time can be reduced (if compared to direct technique), since the provisional shell is fabricated before the patient’s appointment.

2) Decreased heat generation and less chances of allergic reactions due to a smaller amount of acrylic resin in contact with the prepared abutment.
Custom Temporaries

II. Indirect - Direct Provisional Fixed Partial Denture

Disadvantage

1) Need of a laboratory phase before tooth preparation.
2) The adjustments that are frequently needed to seat the shell completely on the prepared tooth.
Custom Temporaries

III. Direct Provisional Fixed Partial Denture

In the direct technique, patient’s prepared teeth and the gingival tissues directly provide the tissue surface form of the provisional restoration eliminating all the intermediate laboratory procedures.
III. Direct Provisional Fixed Partial Denture

Procedure:
Before the tooth preparation, place an acrylic tooth in place of the missing tooth and make an alginate impression or a putty index.
Custom Temporaries

III. Direct Provisional Fixed Partial Denture

Procedure:

1) Prepare the patient’s teeth in the usual manner.
Custom Temporaries

III. Direct Provisional Fixed Partial Denture

Procedure:

2) Lubricate the prepared teeth and the adjacent gingival margins with petroleum jelly, and reseat the index or the alginate impression with provisional restorative material in the dough stage on the tissue surface of the impression.
Custom Temporaries

III. Direct Provisional Fixed Partial Denture

Procedure:

3) Remove and reseat the restoration until it sets.
Custom Temporaries

III. Direct Provisional Fixed Partial Denture

Direct technique
Custom Temporaries

III. Direct Provisional Fixed Partial Denture

Disadvantages

1. potential tissue trauma from the polymerizing resin
2. poor marginal fit.
Dental laminate veneer

Dr. Saraa Almallah
Definition

A veneer is a layer of tooth-colored material that is applied to a tooth to restore localized or generalized defect and intrinsic discolorations.

(Art & science operative dentistry)

Typically, veneers are made of directly applied composite, processed composite or ceramic materials.
History

- Laminate veneers were introduced into dentistry as Hollywood veneers by Pincus (1938).
- They're generally about 0.5 to 0.6 mm thick. That's about twice the thickness of an eggshell.
Types of laminate veneer

Ceramic veneer

Composite veneer
Advantages of veneers include:

1. Minimal tooth preparation required
Advantages of veneers include:

2. Porcelain veneers are stronger and more durable than composite veneers.
Advantages of veneers include:

3. Alternative to full coverage restoration in case of incisal fractures or tooth discoloration.
Advantages of veneers include:

4. Color stability (Ceramic veneer)
Disadvantages of veneers include:

1. Potential for over-contouring
2. Requires laboratory procedures (except directly applied composite)
Disadvantages of veneers include:

3. Porcelain enamel margins may be thin
4. Brittle margins
Disadvantages of veneers include:

5. Cannot be repaired easily
6. Color cannot be altered substantially after placement
Indications

1. Improve discolorations such as tetracycline staining, fluorosis & devitalized teeth.
2. Repair chipped or fractured teeth.
3. Closing of diastemas between teeth.
Indications

4. To lengthen anterior teeth.
5. Improve the appearance of slightly rotated or malaligned teeth
Contraindications

✓ If little or no enamel is present, full crown should be considered.
Contraindications

✓ Mandibular Teeth Restoring mandibular anterior teeth with veneers is much more technically difficult than placing them on maxillary teeth. It is preferable to do crowns instead.
Contraindications

Certain tooth-to-tooth habits like bruxing or clenching, or other para-functional habits such as pencil chewing or ice crushing.
Contraindications

✓ Certain types of occlusal problems such as Class III & end-to-end bites
Treatment Plan Phase

It is important to confirm the following before starting the preparation:

1. Check for contraindications
Treatment Plan Phase

It is important to confirm the following before starting the preparation:

2. Mount study casts
Treatment Plan Phase

It is important to confirm the following before starting the preparation:

3. Check posterior occlusion (anterior teeth do not function alone)
Treatment Plan Phase

It is important to confirm the following before starting the preparation:

4. Confirm that there is no anterior or posterior cross bite
Classification

There are different types of classification for veneers. One of the recently suggested veneer classification (2012) is called *Nankali Veneer Classification* and divides the veneers as follows:

- **Labial Surface Coverage**
  - a) No incisal involvement
  - b) Feathered incisal edge
  - c) Bevel edge
  - d) Incisal overlap
Classification

- Interproximal preparations
  a. leaving the proximal contact intact
  b. breaking interproximal contact

leaving the proximal contact intact

breaking interproximal contact
Classification

- Methods of production

a) Indirect veneers  
b) Direct veneers
Clinical Procedures
Clinical Procedure - Visit 1

1. Impression for study models
2. Bite registration record
3. Photographs
4. Shade selection
Clinical Procedure - Visit 2

Confirm Shade Selection

Preparation

Final Impression
Clinical Procedure - Visit 3

Veneer Cementation
- Try-In/confirm shade Selection
- Cementation (luting)
- Finishing
- Night Guard
Preparation Design for Laminate Veneer

Enamel Reduction Procedures

Enamel reduction should be considered from five distinct aspects:

1. Labial reduction
2. Interproximal extension
3. Sulcular (cervical) extension
4. Incisal modification
5. Lingual reduction
Incisal edge reduction

- Four basic preparation designs -
  - Window
  - Feather
  - Bevel
  - Incisal overlap
**Feather preparation**

- Veneer is *taken up to the* height of the incisal edge but edge is not reduced.

  **Advantage**
  - guidance on natural tooth is maintained

  **Disadvantage**
  - veneer is liable to be fragile at the incisal edge
  - peel/sheer forces during protrusive guidance
Bevel preparation

• A bucco-palatal bevel is prepared across the full width of the preparation and some reduction of the incisal length of the tooth.

Advantage
• more control over the incisal aesthetics

Disadvantage
• more extensive reduction of tooth tissue
Incisal overlap

- *Incisal edge* is reduced and veneer preparation extended onto the palatal aspect of the preparation.

- Provide a positive seat for luting whilst involving more extensive tooth preparation.
Proximal finish lines

- Contact point with adjacent teeth should be maintained.
- Preparation through contact point would require provisional restoration to prevent inadvertent tooth movement between tooth preparation and fitting of the veneers.
Cervical finish lines

- Chamfer with about a 0.4 mm maximum depth
- Finish line should lie just at the crest of the free gingival margin, unless the veneers are being used to mask severe staining

at the crest of the free gingival margin  
under the crest of the free gingival margin
thank you
Cast metal crown

Dr. Saraa Almallah
Definition:
It is a *cast metal crown* gaining its retention by *complete encircling* of the coronal tooth structure. It involves *all axial walls* as well as the *occlusal surface* of the tooth being restored.

The complete cast metal crown has the best longevity of all fixed restorations. It can be used to *rebuild a single tooth* and as a *retainer* for a bridge.
Indications:

1) The complete cast metal crown is indicated for badly 
damaged posterior teeth by caries or 
endodontically treated teeth.
Indications:

2) When high displacement force is expected such as for the retainer of a long span FPD, where grooves should be included as additional retentive features.
1) Treatment objectives can be met with a more conservative restoration.

2) If a high esthetic need exists (anterior teeth).
1) The complete cast metal crown has greater retention and resistance than a more conservative restoration on the same tooth.

2) Superior strength than that of other restoration, easy obtaining good axial contour.
4) **Modification of axial tooth contour** of the maligned teeth is possible.

5) Easy *modification of the occlusion* when the occlusal plane needs to be re-established.
1) The *display of metal* associated with complete cast crown can restrict the restoration only to maxillary molar and mandibular molars and premolars.

2) In case of future complications, *electric vitality testing* of an abutment tooth *cannot be performed* due to the conductivity of the metal.
Criteria of ideal preparation

Preparation for a complete cast crown requires adequate tooth structure to be removed without affecting the pulp and the periodontium as much as possible, to allow restoring the tooth to its original contours and produce a crown of acceptable strength:
1. **Occlusal reduction** must allow adequate room for the restorative material from which, the crown is to be fabricated. Minimum **recommended clearance is 1 mm on non-centric cusp** and **1.5 mm on centric cusps**.
3. Axial reduction should be **parallel to the long axis of the tooth** while allowing for the recommended 6 degree **convergence** between opposing axial surfaces.
The margin should have a **chamfer configuration** and should really be **located supragingivally**. The chamfer should be smooth, distinct and allows for approximately **0.5 mm** of metal thickness at the margin.
Proper placement of functional cusp bevel will be achieved. The bevel must be angled flatter than the external surface to give 1 mm of occlusal clearance. On most teeth the functional cusp bevel will be placed at about 45 degrees to the long axis.
For Maxillary molars often require an additional reduction bevel in the palatal cusps also slight additional reduction in the occlusal third to prevent an over contoured restoration., however For mandibular molars, such additional reduction is done in the buccal cusps.
6. Non-functional (non-centric) cusp bevel:
Adequate reduction of a minimum 0.5 mm is needed at the occluso-axial line angles of the non-functional cusps for adequate strength.
Metal fused to ceramic

Dr. Saraa Almallah
Introduction

In many dental practices the metal-ceramic crown is one of the most widely used fixed restorations. This has resulted in part from technologic improvements in the fabrication of restoration by dental laboratories and in part from the growing amount of cosmetic demands that challenge dentists today.
Introduction

Definition

The restoration consists of a complete-coverage cast metal crown that is veneered with a layer of fused porcelain to mimic the appearance of a natural tooth.
Introduction

The metal part should be 0.3 to 0.5 mm thick.

Occlusally; if veneered: 2 mm non-functional cusps
2.5 mm functional cusps
Introduction

The metal coping in a metal-ceramic restoration is covered with four layers of porcelain:

1. Opaque porcelain
2. Body porcelain (dentin porcelain)
3. Incisal porcelain (enamel porcelain)
4. Glaze porcelain (colorless porcelain)
Introduction

The metal coping in a metal-ceramic restoration is covered with four layers of porcelain:

1. **Opaque porcelain** initiates the development of the shade, and plays an important role in the development of the bond between the ceramic and the metal.
Introduction

The metal coping in a metal-ceramic restoration is covered with four layers of porcelain:

2. **Body porcelain** *(dentin porcelain)* makes up the bulk of the restoration, providing most of the color or shade.
Introduction

The metal coping in a metal-ceramic restoration is covered with four layers of porcelain:

3. Incisal porcelain (enamel porcelain) give translucency to the restoration
Introduction

The metal coping in a metal-ceramic restoration is covered with four layers of porcelain:

4. Glaze porcelain *colorless porcelain* to produce a glossy surface and reduce plaque accumulation and allows plaque to be easily removed.
To be successful, a metal-ceramic crown preparation requires considerable tooth reduction wherever the metal substructure is to be veneered with dental porcelain, which duplicate the appearance of a natural tooth.

The porcelain veneer must have a certain minimum thickness for esthetics. Consequently, much tooth reduction is necessary, and the metal ceramic preparation is one of the least conservative of tooth structures.
Indication:

1) teeth that require complete coverage, where significant esthetic demands are placed on the dentist (e.g., the anterior teeth).
Indication:

2) The metal ceramic crown is indicated for badly damaged teeth by caries or trauma, or existing previous restorations.
Indication:

3) an endodontically treated tooth in conjunction with a suitable supporting structure (a post-and-core).
Indication:

4) need to recontour axial surfaces or correct minor malinclinations.

5) Within certain limits this restoration can also be used to correct the occlusal plane
Contraindication:

1) include patients with active caries or untreated periodontal disease.
Advantages:

1) combines to a large degree, the strength of cast metal with the esthetics of an all-ceramic crown.
Advantages:

2) Natural appearance can be closely matched by externally applied stains.
Porcelain fused to Metal restoration (PFM)

Disadvantages:

1. Unacceptable esthetic due to metal collar and low translucency (inability to transmit light)
Porcelain fused to Metal restoration (PFM)

Disadvantages:
2. Allergic reactions in some patients to metal elements such as nickel in the metal alloy.
Porcelain fused to Metal restoration (PFM)

many trails were made to overcome the esthetic problems:
1. Placing the margin subgingivally
2. Adequate amount of the tooth structure should be removed to accommodate a ceramic material that can mask the underlying metal by an opaque ceramic that also provides the bond between glass ceramic with the metal alloy without over-contouring the restoration.
Porcelain fused to Metal restoration (PFM)

3. Metal coping should stop 1 mm short of the buccal finish line, and a ceramic margin (shoulder ceramic) should be used.
Porcelain fused to Metal restoration (PFM)

4. Gold alloy can be used instead of base metal alloy but the bonding between gold and ceramic is not strong enough.
All ceramic restoration

Dr. Saraa Almallah
Introduction:

Ceramics have been used for dental restorations for a long time. Single jacket crowns were the first all-ceramic restorations, developed by Land in the last century.
All-Ceramic Crowns

When a ceramic restoration is made completely of ceramic material, it is known as an all ceramic restoration.

The most significant developments in dental ceramics within past years have been in new materials and processes for fabricating ceramic jacket crowns.
Compared to traditional metal ceramic, all ceramic offer many benefits:

1) Esthetics

- No black line at the gum line (no metal core)
Advantages:

2) Biocompatibility

- Metal free.
- Reduction of temperature sensitivity due to low thermal conductivity.
- Less gum irritation even with subgingival margins.
1. Increased Removal of Sound Tooth Structure During Preparation. Internal line and point angles should be rounded. (recently, because of improved mechanical all ceramic material no need to sacrifice greater amounts of tooth structure required for tooth preparation)
Disadvantages of all Ceramic Crowns

2. Marginal integrity not as high as all metal crowns (deep chamfer or shoulder finishing line is required)
Disadvantages of all Ceramic Crowns

3. Time consuming process and numerous steps involved
Classification of all ceramic restoration

I. According to materials:

1) glass ceramic (esthetic ceramic)
   - contain 55% or more glass content
   - used in highly esthetic areas
   - leucite based ceramic - feldspathic ceramic
   - e.g. Empress cad blocks
I. According to materials:

2) structural ceramic:
- contain 30% or less glass
- e.g.: lithium disilicate (e-max cad) blocks
I. According to materials:

3) Oxide ceramic:
- contain No glass 99.9% dense
- They have the higher strength.
- e.g.: alumina and zirconia blocks.
II. According to technique of construction:

1. Sintering technique
2. Slip casting technique
3. Heat press (pressable ceramic technique)
4. CAD CAM technique
1. Sintering technique

The crown was constructed by conventional feldspathic porcelain which was fired on a platinum foil matrix.
1) Sintering technique

Technique:

- Construction of a silver plated die
- Adaptation of the platinum foil matrix
Disadvantages: Shrinkage: (30 – 40 % volume shrinkage)

Due to:

1) Loss of water
2) Elimination of voids
3) Melting and fusion of powder particles
Recommendations:

1. Good condensation
2. Increase volume of mass to overcome shrinkage
3. Additional layers
4. Fine grain powder of different sizes \(\rightarrow\) more dense porcelain
2. Slip casting technique

A) Hi-Ceram Crown

The Hi-Ceram technique uses alumina ceramics (40%) and also glass ceramics in a two-step firing procedure to create a high-strength core material.
A) Hi-Ceram Crown

Alumina particles are made to form a porous substructure, which is then infiltrated with molten glass. The combination of these two processes gives the material its excellent fit properties without shrinkage.
A) Hi-Ceram Crown

Indications:

1. Anterior crowns
2. Premolar crowns (limited stresses)
B) In-Ceram

80% by weight alumina crystals → Stronger than Hi-Ceram
B) In-Ceram

**Advantage:**

1) Strong ceramic material due to high concentration of alumina
2) Proper fit
3) Excellent esthetics
3. Heat pressed ceramic (IPS system)

The ceramic material is supplied in the form of cylindrical ingot, which by means of heat-pressing procedure, are used for the fabrication of several all-ceramic restorations ranging from veneers, inlays and onlay to full crowns and even three unite fixed partial dentures from the 2nd bicuspids forward.
(3) Heat Pressed Ceramics (The IPS system)

a. Technique

Constructed by injection molding of precerammed glass-ceramic into a mold after lost wax technique.
Alumina plunger

Ceramic blank

Ring

Lost-wax technique mold
3) Heat Pressed Ceramics

Types:

- IPS Empress
- IPS Empress 2
- IPS e.max
The IPS Empress:

The IPS Empress system started as a project at the University of Zurich in 1983. In 1986, Ivoclar Vivadent took over the project and, after thorough research, introduced it to the dental market in 1990.

The material used in the IPS-Empress is a leucite-reinforced pressable glass ceramic designed primarily for single-unit restorations.
IPS Empress 2:
The IPS Empress system was further developed by the introduction of IPS Empress 2 system, which utilizes the heat-pressing method and a high strength ceramic material that contain lithium disilicate crystals to produce all-ceramic restorations with improved mechanical properties, compared to the heat-pressed leucite-reinforced Empress.
IPS e.max

It has two different types of materials:

a. lithium disilicate glass-ceramic
b. high-strength zirconium oxide
IPS e.max

a. lithium disilicate glass-ceramic

It is ideally suited monolithic single crowns and can even be used for 3-unit bridges in the premolar region. They impress users with their exceptional strength and high-end esthetics.
High-strength zirconium oxide is one of the most efficient all-ceramic materials for dental applications, zirconium oxide is characterized by its excellent biocompatibility and low heat conductivity. It can be used to create single-tooth restorations and long-span bridges. Zirconium oxide can be veneered with IPS e.max® Ceram glass-ceramic (bilayered crown)
4. Machinable ceramic (CAD CAM system)

The evolution of computer aided design / computer assisted machining [CAD/CAM] systems led to the development of new generation ceramics that are machinable.
Advantage:

1. Break the traditional pattern of making restoration manually
Advantage:

2. Bring more development for material science with Excellent biocompatibility
Technique

In general, the use of CAD/CAM systems involves **three** steps.
First, an impression of the prepared tooth and the surrounding tissue is taken either digitally or by a conventional method.
Second, the digital impression is then processed by a computer.
Third, the processed information controls and guides a milling machine that is connected to a computer.
The digital impression can also be used in some techniques to scan the prepared tooth or teeth and the occlusion of the opposing jaw, so an interocclusal record is not required.
Ceramic pre-manufactured blocks from which the CAD/CAM restorations are made are either partially sintered or fully sintered.
A. Soft-machining (partially sintered state milling)

The produced restoration is oversized and is partially sintered. The blocks are milled to an enlarged restoration, which then shrinks during the subsequent sintering process. So, further heat treatment is required to achieve a fully sintered state.
B. Hard-machining (fully sintered state milling)

The blocks used in the hard-machining method are in a fully sintered state and do not require additional heat treatment. Restorations made by this method have a superior fit.
B. Hard-machining (fully sintered state milling)

Disadvantages

1) Wearing down the cutting tool
2) Long fabrication process
3) The laboratory procedure is more complex than that of the soft-machining method.
Cerec system:

Technique

The dentist prepares the tooth being restored either as a crown. The tooth is then powder sprayed with a thin layer of blue anti-reflective contrast medium, imaged by a 3D imaging camera and uploaded to the CEREC computer.
Using the proprietary CEREC software in various modes, a restoration can be designed to restore the tooth to its appropriate form and function. This data on this restoration is stored in a file and is sent via wireless serial transmission or direct wiring to a milling machine.
The restoration can then be milled out of a solid ceramic or composite block. Milling time varies from as little as four minutes to as long as twenty depending on the complexity of the restoration and the version of the milling unit.