TOOTH PREPARATION
FIXED PROSTHODONTICS: FULL VENEER CROWN

Peter Hermann

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TOOTH PREPARATION

- The selected form given to a natural tooth when it is reduced by instrumentation to receive a prosthesis (e.g. artificial crown or a retainer for a fixed or removable prosthesis)

- The selection of the form is guided by clinical circumstances and physical properties of the materials that make up the prosthesis.

  - (Boucher's Clinical Dental Terminology, 4th ed, p239)
Clinical circumstances

Fixed prosthodontics terminology: full veneer crown

Principles of preparation

Crown selection - physical properties of materials

Guidelines for tooth reduction

Margin design

Strategies for taper, resistance and retention

Tooth preparation
CLINICAL CIRCUMSTANCES

- Last year ‘s phantomhead course: Ideal circumstances!
- Clinical practice: Real life!
- Clinical circumstances
- Fixed prosthodontics terminology: full veneer crown
- Principles of preparation
- Crown selection—physical properties of materials
- Guidelines for tooth reduction
- Margin design
- Strategies for taper, resistance and retention
- Tooth preparation
cemented extracoronal restoration covers outer surface of clinical crown
FULL VENEER CROWN:
FPD RETAINER

- Retainer: extracoronal restoration that is cemented to the prepared abutment tooth
INDICATIONS FOR FULL VENEER CROWNS

- Protect weekend tooth structure
- Improve or restore esthetics
- Restore the tooth to function
- Use as a retainer for fixed bridgework
Clinical circumstances

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PRINCIPLES OF CROWN PREPARATION DESCRIBED BY SCHILLINGBURG

- Preservation of tooth structure
- Retention and resistance form
- Structural durability of the restoration
- Marginal integrity
- Preservation of the periodontium
Schillingburg principles determine shape and form of preparation: can not be considered in isolation, there has to be a balance between them!

In reality preparations should be planned according to each individual case and in each case the balance will be different. Approach differs fundamentally from simply cutting „off the shelf” based entirely on text-book diagrams.
Clinical circumstances

- Fixed prosthodontics terminology: full veneer crown
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FOUR MAIN CATEGORIES OF CROWN:

"CROWN SELECTION"

- Metal
- Metal-ceramic PFM
- Ceramic: PJC, HSPC, RBPC
- Composite
  (e.g.: PPF composite—BelleGlass; MFR composite—Gradia: newly developed laboratory materials have not been fully evaluated)

„Material requirements“:
  ➢ Amount of space needed to accommodate the crown
  ➢ And its marginal configuration
SELECT MOST SUITABLE TYPE OF CROWN
(MATERIAL OF CROWN-TOOTH REDUCTION, MARGIN DESIGN):

- Major factor to be considered: amount of tooth destruction you are willing to allow in order to give the esthetics you want

- Tooth preparation:
  - Balance between *conserving tooth structure* on one hand, achieving an *aesthetic and strong* crown on the other!
a. PFM-porcelain fused to metal

b. PJC-porcelain jacket crown

c. RBPC-resin bonded porcelain crown

- Which provides best aesthetics?
- Has the least destructive preparation?
CONSERVING TOOTH STRUCTURE
METAL CERAMIC RESTORATIONS IS 1.2-1.5 MM OF LABIAL REDUCTION, 0.5-1.0 MM OF LINGUAL REDUCTION; DEPENDING UPON WHETHER IT WILL BE METAL OR VENEERED WITH PORCELAIN; AND 2.0 MM OF INCISAL OR OCCLUSAL REDUCTION.

Data from a study that examined the thickness of enamel and dentin of the various teeth in the dental arch indicate that the amount of tooth reduction described above can be accomplished even on lower incisors without compromising pupal health.

<table>
<thead>
<tr>
<th>Table 1</th>
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<tbody>
<tr>
<td>Enamel and Dentin Thickness (mm)*</td>
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<tr>
<td>Maxillary Central Incisor</td>
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<td>Maxillary Cuspid</td>
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<tr>
<td>Mandibular Incisor</td>
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<tr>
<td>Mandibular Cuspid</td>
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</tbody>
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CROWN SELECTION

- Full veneer metal crown VMC:
  - Advantage: require little tooth prep!
  - Disadvantage: aesthetics!
PORCELAIN FUSED TO METAL CROWN PFM

- Strength & aesthetics
- Prep to accommodate both porcelain & metal destructive!
Full metal: 1.5 mm functional & 1.0 mm nonfunctional cusp reduction

Metal-ceramic: **2.0 mm functional** (metal 0.3-0.5 mm, opaque 0.3-0.5 mm, porcelain 1.0-1.2 mm) & **1.5 mm nonfunctional cusp**

*Logical use of metal lessens the amount of tooth reduction*
CROWN SELECTION

- Porcelain Jacket Crown PJC
Crown selection

Resin bonded porcelain crowns (RBPC)

Empress/www.ivoclar.com
IMPROVED CERAMIC MATERIALS
RESIN BONDED PORCELAIN CROWNS (RBPC)

- Glass Ceramic
  Dicor-castable glasses
  IPS Empress-pressed leucite system
  IPS e.max  Press
- advanced functional and aesthetic features
- laboratory process casting, pressing, CAD/CAM
- “bonded” to the remaining tooth structure using a
dental BisGMA based composite resin
Crown selection

Improved Ceramic Materials

**High strength porcelain crowns HSPC**

- Oxide ceramics:
  - Aluminium-oxide
  - Zircon-oxide: ZrO295%+ 5% Yttrium

- High strength underlying core to support veneering porcelain which gives the final shape and aesthetic attributes required for the restoration.

- No need for metal substructure

- CAD/CAM systems
- Deep chamfer at the finish line to allow the profile of the die to be scanned
- Corners, line angles rounded
- Enough tooth tissue to be removed for adequate thickness of porcelain
HIGH STRENGTH PORCELAIN CROWNS HSPC

- **Preparation** (dimensions in mm)
Clinical circumstances

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Tooth preparation
## BALANCE: CONSERVING TOOTH STRUCTURE & AESTHETIC, STRONG CROWN

<table>
<thead>
<tr>
<th>Crown type</th>
<th>Anterior crowns — preparation features</th>
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<tbody>
<tr>
<td></td>
<td>Occlusal reduction*</td>
</tr>
<tr>
<td>PJC</td>
<td>2 mm incisally</td>
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<tr>
<td>RBPC</td>
<td>2 mm incisally</td>
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<tr>
<td></td>
<td>1 mm lingual aspect</td>
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<tr>
<td></td>
<td>0.5–1.0 mm lingual aspect</td>
</tr>
<tr>
<td>PFM</td>
<td>2 mm incisally</td>
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<td>0.5–1.0 mm lingual aspect</td>
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<td>(porcelain guidance requires greater clearance)</td>
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- Use depth cuts & knowledge of appropriate bur end diameter
MARGINAL INTEGRITY

- Margins of restoration must be closely adapted to finish line of preparation
- Configuration of the preparation finish line dictates the shape of restorative material in the margin of the restoration
- Preservation of the periodontium
- Margins as smooth as possible
- Kept clean by the patient
- Duplicated by the impression
- Placed in enamel if possible
- Supragingival placement of finish lines whenever possible!
- Subgingival finish lines 2.0 mm from alveolar crest (combined dimension of epithelial and connective tissue attachments)
FINISH LINE CONFIGURATIONS

- Slice-Knife-edge
- Marxkors, Bevel
- Chamfer/shoulder with a bevel

- Shoulder
- Chamfer
KNIFE EDGE AND SLICE:

- Less destruction of tooth structure
- Difficult to follow both on tooth and die, axial reduction fade out instead of terminating a definite finish line
- Thin margin that fits finish line difficult to wax and cast
- Overcontoured restorations
- Indicated only on axial wall toward tooth is tipped-preservation of tooth structure!
SHOULDER

- Recommended for all-ceramic restorations only
- Resistance to occlusal forces and minimize stress that might lead to porcelain fracture
- Adequate bulk of material at the margin
- Require much tooth structure destruction
- 90 degree internal line concentrates stress-coronal fracture!
- Radial shoulder: rounded internal angle
- Shoulder with a bevel: adding a bevel to a shoulder creates acute edge of metal at the margin
CHAMFER

- Cast metal restorations: acute margin, sufficient thickness and strength
- Rounded concavity, lower stress concentration within cement film
- Cut with the tip of a round-end tapered diamond, axial reduction with side of instrument
- Heavy chamfer-large radius internal angle 90 degree surface: ceramic restorations!
- Chamfer with a bevel: bevel added for use with a metal restoration
FINISH LINES WITH MARGINAL CONFIGURATIONS FOR PFM:

a) Shoulder with porcelain butt fit;
b) Deep chamfer with metal collar;
c) Shoulder plus chamfer (bevel) with metal collar;
d) Knife edge with metal margin;
and
e) Chamfer with metal margin
FINISH LINES with MARGINAL CONFIGURATIONS FOR CERAMICS
RBPC, HSPC: ROUNDED INTERNAL ANGELS

- Rounded shoulder
- Chamfer
- Incorrect chamfer
- Knife edge
Clinical circumstances

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TAPER

- The more nearly paralell the opposing walls of a preparation, the greater should be the retention.

- Walls are tapered:
  - visualize preparation walls
  - prevent undercuts
  - compensate fabrication inaccuracies
  - permit complete seating during cementation
• CA: convergence angle
  Total occlusal convergence of a preparation
• AI: axial inclination
  Angle of the preparation wall relative to the line of draw of the preparation
• Sum of the axial inclination of two opposing walls equals the convergence angle.
• Symmetrical preparation: CA is twice the value of the axial inclination

• Angle between the hour and minute hand at 12:01 is 5.5 degree
  Diamond rotary cutting instrument held parallel to the path of insertion when preparing the axial surfaces:
  AI equals to that of the diamond being used
  12 degree to insure absence of undercuts
  Overall target: 10–22 degree

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RETENTION AND RESISTANCE

- Geometric configuration of tooth preparation
- Retention prevents removal along the path of insertion or long axis
- Resistance prevents dislodgement of oblique forces
- Retention and resistance are interrelated and inseparable qualities
- Occlusogingival length: factor of retention and resistance!

- Greater the surface area of preparation (longer preparation), the greater its retention= preparations on large teeth are more retentive than preparations on small teeth
  - Cement creates mechanical interlocks between inner surface of restoration and axial wall of preparation
  - Surface area can be increased by adding boxes and grooves
- The shorter the wall the more important its inclination
- Shorter preparations: as little taper as possible to increase resistance
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Preparation Kit
- Chamfer diamond (chamfer production)
- Large flame or 'rugby ball' diamond (lingual concavity production)
- Long needle diamond (initial proximal reduction)
- Fissure (seating groove)
- Flat-end tapered diamond (occlusal and axial reduction)
- Long, round-end tapered diamond (occlusal and axial reduction and also shoulder production)
POSTERIOR TOOTH PREPARATION
FULL VENEER CROWN
occlusal reduction
FULL VENEER CROWN

functional cusp bevel
FULL VENEER CROWN

Axial reduction & chamfer finish line
FULL VENEER CROWN

Axial reduction & chamfer finish line
FULL VENEER CROWN
Seating groove
THANK YOU FOR YOUR ATTENTION!