NEW MATERIALS AND TECHNIQUES IN PROSTHODONTICS

Asbjørn Jokstad, Professor, Dr.Odont.
Department of Prosthodontics and Oral Function
Institute of Clinical Dentistry
University of Oslo, Norway

Turkish Dental Association, Istanbul, 24th June 2005

New materials & methods
- Dental implants
- Articulators
- Precision attachments
- Repairs (Ceram fracture, crown removal, post retrieval, etc.)
- Denture fabrication: production, materials, lining & repairs
- Laboratory: process & new materials

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New materials & methods—Fixed prostheses

1. Rotating instrument
2. Root Post
3. Gingival retraction
4. Impression
5. Bite & jaw registration
6. Color shade
7. Temporary construction
8. Restorative materials
9. Production techniques
10. Cementation

Preparation & finishing kits

- Acrylic Adjustment Kit
- R.A.P.T.O.R. Resin Sculpting Set
- R.A.P.T.O.R.
- Brasseler
- Acrylic Temporization Kit
- Anterior Bur Box
- Esthetic Inlay/Onlay
- Nixon Inlay/Onlay II
- Nixon Porcelain Veneer II Laminate Veneer System
- Ultra Denture Adjustment & Polishing Kit

Cosmedent
Top Finisher System

Dentsply/Caulk
Enhance Composite Finishing and Polishing System

Nobel Biocare
Procera Preparation Kit

New materials & methods—Fixed prostheses

1. Cast
2. Prefabricated
   - Metal
   - Non-metal
1. Cast posts
   • Indirect technique
     - Impression
   • Direct technique: Post & resin
     - Wax
     - Resin
       - Accuset
       - ExactaCast
       - LumineX
       - GC Pattern Resin

2. Prefabricated posts
   1. Cast Posts
      - Indirect
      - Direct: Post & resin
   2. Prefabricated Posts
      Additional core
      Metal: No
      Non-metal: Yes
      > 30 products

“Core”-materials

|     | Bisco | Light co. | Jeneric | Dual co. | Den-Mat | Chem.co | Den-Mat | Light.co | Vivadent | Chem.co | Den-Mat | Chem.co | Bisco | Chem.co | sds/Kerr | Dual co. | Light.co | GIC |
|-----|-------|-----------|---------|----------|---------|---------|---------|----------|----------|---------|---------|--------|--------|--------|---------|---------|---------|--------|-------|-----|
2. Prefabricated posts, metal

- Steel
- Titanium-alloy
- Titanium

“Active” vs. “Inactive”

- Conical
- Parallel
- Steps
- Threaded
- Smooth
- Structured
- Slots & grooves
- Flat
- Conical
- Ovoid

2. Prefabricated post, non-metal

Five main groups

1. Ceramic, prefabricated
2. Ceramic, made in the dental laboratory

Posts made in ceramics

Prefabricated
- Biopost (Incermed), ZrOx, D, ~ 1990
- Cerapost (Brasseler), 1995
- Cosmopost (Ivoclar), 1998

Laboratory
- “Cosmopuck” (Ivoclar), 1998
- In-Ceram (VITA), 1994
2. Prefabricated post, non-metal
Five main groups:
1. Ceramic, prefabricated
2. Ceramic, made in laboratory
3. “Black post”, Carbonfibres dispersed in resin
4. “White post”, Quartsfibres dispersed in resin
5. “Translucent post”

Non-metal, non-ceramic posts - many variants
Quarts
Quarts+Zirkonium (Carbon)
Quarts & Carbon
 composite
“resin”
epoxy
polyester

New materials & methods - Fixed prostheses
1. Cord
   • Impregnated
   • Non-impregnated
2. Gel/paste
3. Cotton
4. Electrosurgery
5. (Cobber-tube)
### Retraction cords, impregnated

<table>
<thead>
<tr>
<th>Product</th>
<th>Producer</th>
<th>Active substance</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altrac</td>
<td>VOCO</td>
<td>AlCl3</td>
<td>twinned</td>
</tr>
<tr>
<td>Biopak</td>
<td>SDI</td>
<td>dl-Adrenalin (4-ply)</td>
<td>twinned</td>
</tr>
<tr>
<td>Crown-Pak</td>
<td>Gingi-Pak</td>
<td>Fe2(SO4)3</td>
<td>woven</td>
</tr>
<tr>
<td>Ging-Aid</td>
<td>Gingi-Pak</td>
<td>dl-Adrenalin</td>
<td>twinned</td>
</tr>
<tr>
<td>Gingi-Pak</td>
<td>Gingi-Pak</td>
<td>dl-Adrenalin (Dip- Soft-twist)</td>
<td>woven</td>
</tr>
<tr>
<td>Gingi-Tract</td>
<td>Dem-Matt</td>
<td>AlSO4</td>
<td>twinned</td>
</tr>
<tr>
<td>Gingibrad</td>
<td>VanR</td>
<td>AlKSO4/adrenalin + Aluminium</td>
<td>braided</td>
</tr>
<tr>
<td>Hemadin</td>
<td>VOCO</td>
<td>Adrenalin</td>
<td>braided</td>
</tr>
<tr>
<td>Hemodent</td>
<td>HAW Premier</td>
<td>AlCl3 23%</td>
<td>twinned</td>
</tr>
<tr>
<td>PacoBraided</td>
<td>Pascal</td>
<td>ABO</td>
<td>braided</td>
</tr>
<tr>
<td>Racetynol</td>
<td>Septodent</td>
<td>AlCl3 + lignocain</td>
<td>braided</td>
</tr>
<tr>
<td>Racord</td>
<td>Pascal</td>
<td>dl-Adrenalin +Zifenolsulfonat 0.3%</td>
<td>twinned</td>
</tr>
<tr>
<td>Retrace</td>
<td>Roeko</td>
<td>AlSO4</td>
<td>braided</td>
</tr>
<tr>
<td>Sil-Trax</td>
<td>Pascal</td>
<td>AlSO4/dl-admHCl/dl-adr + Zifenolsulfonat</td>
<td>braided</td>
</tr>
<tr>
<td>Retracord</td>
<td>Henry Schein</td>
<td>AlSO4/Adrenalin twin/braid</td>
<td>braided</td>
</tr>
<tr>
<td>Tracopascal</td>
<td>Pascal</td>
<td>AlSO4</td>
<td>braided</td>
</tr>
<tr>
<td>Ultra</td>
<td>Sultan</td>
<td>AlK N.F/Adrenalin HCl 4%</td>
<td>braided</td>
</tr>
<tr>
<td>UltraBraided</td>
<td>VanR</td>
<td>Adrenalin-alum</td>
<td>braided</td>
</tr>
<tr>
<td>Z-Twist</td>
<td>Gingi-Pak</td>
<td>dl-Adrenalin</td>
<td>braided</td>
</tr>
</tbody>
</table>

### Retraction cord, non-impregnated

Astringedent (Ultradent), First Stop (Stevenson), Gingi-Aid (Gingi-Pak), Gingiva liquid (Roeko), Hemodent (HAWE Premier), Hemo-gin (Van R Dent Prod), Hemo-stat (Henry Schein), Ocu Clear (Health Care Prod), Orostat (Gingi-Pak), Rastringent (Pascal Comp), Racemistat (Pascal Comp), Stasis (Gingi-Pak), Styptin (Van R Dent Prod), Ultralbad (Ultradent Alum Chlor. (Ultradent), ViscoStat (Ultradent), Visine (Pfizer Inc), Wet Pack (Van R Dent Prod.)
New materials & methods–Fixed prostheses

- Rotating instrument
- Root Post
- Gingival retraction
- Impression

A perfect impression

1. Influence of the impression material?
Most commonly used materials in USA

<table>
<thead>
<tr>
<th>Material</th>
<th>Crowns</th>
<th>Inlays</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vinyl siloxane</td>
<td>81%</td>
<td>71%</td>
</tr>
<tr>
<td>Alginate</td>
<td>38%</td>
<td>20%</td>
</tr>
<tr>
<td>Polyether</td>
<td>28%</td>
<td>22%</td>
</tr>
</tbody>
</table>

*Dental Products Report Survey, Nov 2000 n= 319 dentists*

A perfect impression

2. Influence of the impression technique?

Method 1 - Dual-arch
SYN: Dual-arch impression, Double-arch impression, Triple tray technique, Closed-bite impression, Double arch single mix impression, Double arch double mix impression

<table>
<thead>
<tr>
<th>Dual-arch</th>
<th>Patient comfort</th>
<th>Maximum intercuspid</th>
<th>Easy for laboratory</th>
<th>Time</th>
<th>Occlusion?</th>
</tr>
</thead>
</table>
Method 2 -
One polymerisation phase  
- one viscosity

SYN: One phase technique, Single phase impression,  
Medium viscosity technique, Single mix technique,  
Single mix single impression, Monophase technique

Materials - ex.
Aquasil Monophase Dentsply  
Examix Monophase GC  
Imprint II 3M Espe  
Impregum F 3M Espe  
Provil Novo Monophase Kulzer  
President System 75 Coltene

Method 3 -
One polymerisation phase  
- two viscosities

SYN: Double mix technique, Double mix single impression, Express technique, One step putty wash technique, Sandwich impression, Simultaneous one-step technique, Two phase technique/ impression, Wet/Wet impression

Materials - ex.
Aquasil Putty + Reprosil HF Light Dentsply  
Examix Putty + Examix Regular eller Inject GC  
Express Putty + Express Medium 3M Espe  
Impregum F + Permadyne 3M Espe  
Optosil Comfort P Plus + Xantopren Kulzer  
President Heavy + President (Jet) Light Coltene

Method 4 -
Two polymerisation phases  
- two viscosities

SYN: Correction impression, Double Impression,  
Double mix double impression, Overlay impression, Putty-wash technique / impression, Two-step putty-wash technique, Wash technique, Wet/Dry impression

Materials - ex.
Coltoflax + Coltex Xtrafine Coltene  
Panasil Heavy + Panasil Regular Kettenbach  
President Putty Soft + President (Jet) Light Coltene  
Examix Putty + Examix Regular GC  
Express Putty + Express Medium 3M Espe  
Aquasil Putty + Reprosil HF Light Dentsply
Alternative method 5 - "Hydraulic principle"

For upper anterior abutments with fragile gingiva

Alternative method 6 - "Laminar" principle

(Ref: G Schoenrock (1989))

For lower posterior abutments with dry work field problems
Alternative method 7
- Tube-section

The safest technique when abutments are periodontally unstable

A perfect impression

1. Dual-arch
   1. Metall
   2. Plastic
2. Other
   1. Metall
   2. Plastic
   3. Individual

3. Influence of the impression tray?

Trays - Dual-arch
- Bite Relator (Temrex)
- Bite Tray (Kerr)
- Exacta
- First Bite
- Quad-Tray
- Tri-Bite (Tri-Bite)
- Triple Tray (Premier)
Trays - metal
- Platinated brass
- Steel
- Titanium
- Aluminium
- Perforated
- Uperforated

Trays - metal, for implant prosthodontics
- Kohler Medizintechnik
Trays - plastic

Most used in USA
Percent used for impressions

<table>
<thead>
<tr>
<th>Material</th>
<th>Crowns /bridges</th>
<th>Inlays /onlays</th>
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<tbody>
<tr>
<td>Vinyl siloxane</td>
<td>81%</td>
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Do you ever use individual tray?
Yes 73%  No 24%

*Dental Products Report Survey, Nov 2000 n= 319 dentists

Tray - individual

<table>
<thead>
<tr>
<th>Brand</th>
<th>Type</th>
<th>Heat/Vacuum</th>
<th>Light</th>
<th>Chemical</th>
<th>Chemical/Light</th>
<th>Chemical/Light</th>
</tr>
</thead>
</table>
New materials & methods - Fixed prostheses

- Rotating instrument
- Root Post
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- Impression
- Bite & jaw registration
- Color shade
Digital Shade Systems
- Dental Color Analyser (clearlight.com/~aei)
- Metalor-ikam system (metalor-ikam.com)
- Pocketspec (Pocketspec.com)
- ShadeVision /ShadeRite (X-Rite.com)
- Shadescan (Cynovad.com)
- Spectroshade (mhtint.com)
- ShadeEye NCC (Shofu.com)

Hue
Chroma
Value

New materials & methods- Fixed prostheses
- Rotating instrument
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- Bite & jaw registration
- Color shade
- Temporary construction
Alternatives

- Bis-Acrylic composite
- Polymethyl metacrylate
- Polyethyl methylacrylate
- Microfill light cured
- UDMA composite

Bis-acryl most popular

What type(s) of material(s) do you use to fabricate temporary restorations in your office?

- Bis-acrylic composite
- Polymethyl metacrylate
- Polyethyl methylacrylate
- Microfill light cured
- UDMA composite

*Results are based on responses from a random sample of dental professionals.
Chemical cured

- Cool Temp
- Integrity
- Luxatemp Automix
- Protemp 3 Garant
- Structur 2
- Tempofil
- Trim II H

Integrity Dentsply
Luxatemp Automix DMG
Protemp 3 Garant 3M ESPE
Structur 2 VOCO GmbH
Tempofil Detax
Trim II H Bosworth

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Temporary cements

- Eugenol-containing
  - E.g. Temp-Bond og IRM
- Non-eugenol-containing
  - E.g. Nogenol og Dycal
- Light & chemical cured
  - E.g. Provilink

Zinc oxides top for cements
What types of materials do you use for restoration of temporary material?

- Jut oxide eugenol 45%
- In-situ eugenol 35%
- Base 25%
- Nopatoil 10%
- Wax 10%

*Values are expected from December 2005. CCL.

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- Restorative materials

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Most used in USA – full ceramics
1. Pressed 63%
   (e.g., Empress, OPC)
2. Aluminium-oxide 46%
   (e.g., Procera)
3. Lithium disilicate 36%
   (e.g., Empress 2)

New materials & methods – Fixed prostheses

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Production techniques

Production techniques – CAD-CAM (CAD-CAM)

- BEGO Medifacturing
- BEGO Medical
- CAD/CAM System
eikon
- CELAY
- Mikrona Technologie
- Cercon®
- Dentsply/Degudent/Degussa Dental
- CEREC3/CEREC Inlab
- Sirona Dental Systems
- CICERO®
- Civo Dental Systems
- DCS President
- DCS Dental
- DECIM
- DECIM
- DENT. CAD/CAM GN-1
- GC Corporation
- digiDENT®
- Glivin Dental
- Everest
- KaVo Elektrotechnisches
- Lava®
- 3M ESPE Dental
- PRO 59
- CYNODENT®
- Procera®
- Nobel Biocare
- WOL-CERAM
- WDT-Wolz-Dental-Technik
- Xawex
- Arnold Wohlend
1. Development of materials, e.g. Ceramics

(Tensile strength, MPa)

2. Development of software

Time - precision

CEREC 1 CEREC 2

3. Development of production units
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- Production techniques
- Cementation

Water-based - conventional
- Glassionomer

Water-based: Glassionomer
Zinkphosphate cement

1. Clean surface with $\text{H}_2\text{O}_2$, wash, dry
2. Mix powder and liquid
3. Apply cement in crown
4. Place crown on prepared tooth
5. Wait
6. Remove surplus with probe
7. Inspect crown margin

Thank you for your kind attention