Contemporary Caries Management For Older Patients: The Evidence For ART

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Aims

- To provide an overview of dental diseases (caries) in older patients
- To discuss the challenges of managing dental caries in older patients
- To discuss preventative regimes for older patients
- To provide an overview of MID treatment approaches to manage caries in older patients
- To discuss the use of ART in older patients
Scenario

1. Growing proportion of older people
2. Poor oral health
3. High caries prevalence
4. Heavily restored dentition
5. Challenging oral environment
6. Low dental attendance
Oral Health of Older People

Figure 2. Mean dental caries experience (DMFT) among older people 65 years or more across WHO Regions (WHO, 2007).

Global oral health of older people- Call for public health action- Petersen et al., 2010
Trends in Oral Health

- Decline in the number of edentulous older adults
- More adults retaining 21 or more natural teeth

Steele et al., 2012
Trends in Oral Health

- Better attitudes towards oral health
- Increasingly complex oral environments (restorative history/polypharmacy)
- More teeth = more dental problems - CARIES!
Burden of Dental Caries

• One of the most common preventable childhood diseases
• It is the primary cause of oral pain and tooth loss
• Untreated caries in permanent teeth – 35% globally (GBD 2010 study)
Caries in Older Patients

Root caries: High prevalence among elderly
- Gingival recession
- Area is prone to plaque retention/Higher critical pH
- Fast development
Caries in Older Patients

Caries incidence

- Community dwelling without dementia: Coronal 1.4, Root 0.9
- Community dwelling with dementia: Coronal 3.6, Root 1.7
- Nursing home residents: Coronal 2.5, Root 1

Chalmers JM, 2001
Caries in Older Patients

Photo: Dr Martina Hayes
Challenges

- General health/Polypharmacy
- Level of independence
  - Functionally independent
  - Frail elderly
  - Functionally dependent
Challenges

Complex oral environments
Cariogenic diets/medication
Dental habits
Manual dexterity
Challenges

• Restoration maintenance

• Adaptation to new dentures?

Photo: Prof. Finbarr Allen
Challenge

How to achieve the goal: Teeth for life?
Minimally Intervention Dentistry (MID)

- Risk assessment
- Detect lesions as early as possible
- Remineralisation of enamel and dentine
- Optimal caries preventive measures
- Use conservative operative interventions
- Repair rather than replace restorations
Risk Assessment

How to assess risk?

- Caries experience
- Diet
- Salivary flow
- Oral hygiene
- Exposure to fluoride
Dry Mouth
Fluoride

Cornerstone of Prevention
• Inhibits demineralization
• Increases enamel resistance
• Inhibits bacterial metabolism
• Effectiveness linked to fluoride content
• Cost-effective
Fluoride Products
Clinical Review

Systematic Review on Noninvasive Treatment of Root Caries Lesions

R.J. Wierichs$^1$ and H. Meyer-Lueckel$^1$
Fluoride Study I

Root caries initiation and root caries inactivation

- Dentifrice 5,000 ppm F vs 1,100 to 1,450 ppm F
- 1.5% arginine plus 1,450 ppm F vs 1,450 ppm F only
- 225 to 900 ppm F rinse vs placebo rinse
- CHX varnish (1-10%) vs placebo
- Fluoride varnish(22,600 ppm F) vs placebo
- SDF varnish vs placebo

Wierichs et al., 2015
Fluoride Study I

Wierichs et al., 2015
Fluoride Study I

Wierichs et al., 2015
Conclusions

- 5,000 ppm F toothpaste is recommendable for elderly people - highly effective
- Arginine containing toothpaste seems effective (low level of evidence)
- Daily use of NaF rinses seems to reduce initiation of root caries lesions
- CHX (1% to 19%) varnish - Possible root caries inhibiting effect
- Fluoride varnish every 3 months reduces initiation and inactivate more RCLs than placebo.

Wierichs et al., 2015
High-fluoride toothpaste: a multicenter randomized controlled trial in adults

Fluoride Study II

High Fluoride Toothpaste vs Regular Toothpaste
- Adult patients with root caries—mean age 56
- 2 intervention groups
  - 1) High-fluoride toothpaste with 5,000 ppm
  - 2) Regular fluoride toothpaste with 1,350 ppm
- Surface hardness scoring baseline/3/6 months

Srinivasan et al., 2014
### Table 4. Changes observed in the combined mean surface hardness scores (all centers)

<table>
<thead>
<tr>
<th>Observation time</th>
<th>Test group</th>
<th>Control group</th>
<th>Intergroup comparison$^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$T_0$</td>
<td>3.4 ± 0.61</td>
<td>3.4 ± 0.66</td>
<td>$P = 0.8757$</td>
</tr>
<tr>
<td>$T_1$</td>
<td>2.9 ± 0.67</td>
<td>3.1 ± 0.75</td>
<td>$P = 0.1787$</td>
</tr>
<tr>
<td>$T_2$</td>
<td>2.4 ± 0.81</td>
<td>2.8 ± 0.79</td>
<td>$P = 0.0067$</td>
</tr>
</tbody>
</table>

#### Intragroup comparison$^a$

- $T_0$ versus $T_1$: $P = 0.0008$
- $T_0$ versus $T_2$: $P < 0.0001$
- $T_1$ versus $T_2$: $P < 0.0001$

Srinivasan et al., 2014
Conclusions

- The use of high-fluoride toothpaste (5,000 ppm F), twice daily significantly improves surface hardness of untreated root caries lesions, when compared with the use of regular toothpastes (1,350 ppm).

Srinivasan et al., 2014
Management Strategy

High Risk Patients

• Daily use of 5,000 ppm F toothpaste (Duraphat)
• Application of F varnish (22,600 ppm) once a month
• Dental examinations at least every 6 months

Bearing in mind: Compliance

Ship, 2002
Prevention

Amorphous Calcium Phosphate- CPP-ACP

*GC Tooth Mousse*
Oral Hygiene

- Frequency
- Toothpaste/toothbrush
- Technique
- Modify toothbrush
Surgical Approach
Surgical Approach

Tissue saving cavity “design”

Uses round burs and excavators to remove caries

Materials used

- Resin composites
- Glass ionomers - GIC
- Resin-modified glass ionomers - RMGI
Caries

Caries-infected dentine
• Outermost, superficial, necrotic zone
• Mineral component extensively destroyed
• High bacterial load
• Dentine tubule structure is destroyed

Affected dentine
• Inner layer
• Less mineral dissolution
• Collagen less damaged
• Lower bacterial content
• Dentine tubule structure gradually returns
Atraumatic Restorative Treatment: Clinical, Ultrastructural and Chemical Analysis

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Caries Removal

Soft infected dentine was removed with an excavator

Samples taken from cavity floor before and 3 months after restoration with GIC

Assessment:
• Clinical
• Dentine structure and microorganisms - SEM
• Chemical (Microanalysis)

Massara et al., 2002
Caries Removal

Results after 3 months

• Clinical: dentine showed a harder texture
• Structural: Intertubular dentine was dense, collagen fibers in a more compact arrangement
• Microorganisms: drastic reduction in number
• Chemical: Calcium concentration in dentine increased from 30% to 48%

Massara et al., 2002
Caries Removal

Conclusion

- Hand excavation allows a one-session approach with the purpose of creating more favourable conditions for the healing process.

Massara et al., 2002
Methods of Caries Removal

- Rotary instrumentation
- Hand excavation
- Gel (chemo-mechanical)
- Sono-abrasion
- Air abrasion
- Laser
In-vitro Study

Five alternative methods studied to measure

- Amount of infected dentine removed
- Cleaning time

Banerjee et al., 2000
In-vitro Study

Conclusion

• Use of handpiece and bur was too invasive
• Sono-abrasion was insufficient
• Chemo-mechanical was adequate but slow
• Hand excavation and air-abrasion were the best methods for removing infected dentine

Banerjee et al., 2000
Restorative Materials

Composites
Glass ionomers
Resin-modified glass ionomers
Restorative Material Selection

It depends on:
Size of cavity
Aesthetics
Patient’s oral health behaviour
Longevity required
Skills of the operator
Working conditions
Glass Ionomers

Powder
  • A fluoride glass

Liquid
  • A water-soluble organic (poluyalkenoic) acid, mostly polyacrilic acid
Glass Ionomers

• Bond to enamel and dentine without acid etching
• Leach fluoride into oral environment (anticariogenic effect?)
• Pulp-friendly
Glass Ionomers

Physical characteristics

• Wear resistance:
  • Usually lower than composite
  • Decreases in acid environment
  • Increases with maturation

• Compressive strength:
  • Depends on powder liquid ratio
  • Increases with maturation
Atraumatic Restorative Treatment (ART)
ART

- Removal of only soft carious tissue with hand instruments and filling of the cleaned cavity with an adhesive material such as glass ionomer (high viscosity), sealing pits and fissures.
# ART Studies

<table>
<thead>
<tr>
<th>Studies</th>
<th>Population</th>
<th>Surfaces treated</th>
<th>Follow up</th>
<th>Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>De Amorim, Leal et al., 2012</td>
<td>Meta analysis</td>
<td>Single surface</td>
<td>5 years</td>
<td>80%</td>
</tr>
<tr>
<td>Zanata et al., 2010</td>
<td>High risk pregnant women</td>
<td>Single surface</td>
<td>10 years</td>
<td>65.2%</td>
</tr>
<tr>
<td>Hu, Chen et al. 2005</td>
<td>Radiotherapy patients</td>
<td>Root surface</td>
<td>2 years</td>
<td>66.2%</td>
</tr>
<tr>
<td>Honkala &amp; Honkala, 2002</td>
<td>Homebound elderly Mean age 74.5</td>
<td></td>
<td>1 year</td>
<td>79%</td>
</tr>
<tr>
<td>ECM Lo, 2006</td>
<td>Homebound elderly</td>
<td></td>
<td>1 year</td>
<td>86.4% vs 92.1%</td>
</tr>
</tbody>
</table>
Two-year survival of ART restorations placed in elderly patients: A randomised controlled clinical trial

Cristiane da Mata a,*, P. Finbarr Allen a, Gerald McKenna b, Michael Cronin c, Denis O’Mahony d, Noel Woods e
Methods

- RCT
- Patients from a geriatric hospital and a community centre
- Prophylaxis and OHI
- ART vs conventional technique with RMGI
- Follow up: 6, 12 and 24 months
- ART criteria used for assessment

Da Mata et al., 2015
Surfaces Treated

Da Mata et al., 2015
## Results

<table>
<thead>
<tr>
<th>Restorations status</th>
<th>6 months</th>
<th>1 year</th>
<th>2 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total assessed</td>
<td>ART</td>
<td>CT</td>
<td>ART</td>
</tr>
<tr>
<td>Total assessed</td>
<td>118 (83%)</td>
<td>124 (78.4%)</td>
<td>127 (89.4%)</td>
</tr>
<tr>
<td>Present, in good condition</td>
<td>108 (91.5%)</td>
<td>115 (92.7%)</td>
<td>111 (87.4%)</td>
</tr>
<tr>
<td>Acceptable marginal defect or wear</td>
<td>6 (5%)</td>
<td>7 (5.6%)</td>
<td>8 (6.2%)</td>
</tr>
<tr>
<td>Restoration partly or completely missing *</td>
<td>4 (3.3%)</td>
<td>2 (1.6%)</td>
<td>7 (5.5%)</td>
</tr>
<tr>
<td>Caries present *</td>
<td>0</td>
<td>0</td>
<td>1 (0.7%)</td>
</tr>
<tr>
<td>Cumulative survival proportions</td>
<td>96.6%</td>
<td>98.3%</td>
<td>93.7%</td>
</tr>
</tbody>
</table>

Da Mata et al., 2015
ART - 2 Year Results
ART Instruments
ART Technique

Access to caries
Caries removal

Cavity conditioning
ART Technique

Cavity conditioning
(20% polyacrylic acid)

- Cleans the surface
- Activates the Ca++ in tooth tissue
- Increases surface energy
- Increases the bond strength
ART Technique

• Mixing GIC
• Insertion of GIC into the cavity (finger pressure)
• Protection of restoration with a coating
• Check occlusion
• Re-apply coating
Survival Predictors

- Size of the cavity
- Number of surfaces (single x multiple-surface)
- Restorative material used
- Adequate removal of demineralized dentin
- Presence of adequate caries control measures
- Operator training/experience.
ART in the Elderly

- Patient-friendly
- Cost-effective
- MID restorative approach
- Treating nursing home/frail elderly
- It could be performed by other members of the dental team
Conclusions
Acknowledgement

I would like to kindly thank Colgate for sponsoring this presentation.