MINIMUM INTERVENTION DENTISTRY – ESSENTIAL CONCEPTS

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Professor and Head, Restorative Dentistry
Melbourne Dental School
The University of Melbourne
Australia
SUMMARY

• overview of Minimum Intervention (MI)
  ➔ definition of MI
  ➔ elements of MI
  ➔ dental caries
    ▪ caries risk assessment
    ▪ prevention
    ▪ remineralisation (medical) techniques
  ➔ operative (surgical) techniques
  ➔ management of defective restorations
DEFINITION OF MI

- an approach to the management of dental caries with the aim of minimising the loss of tooth structure by disease or by iatrogenic intervention
Minimal intervention dentistry – a review*

FDI Commission Project 1-97

Martin J. Tyas
Melbourne, Australia
Kenneth J. Anusavice
Gainesville, USA
Jo E. Frencken
Nijmegen, The Netherlands
Graham J. Mount
Adelaide, Australia

Int Dent J 2000;50:1-12

FDI STATEMENT

Minimal Intervention in the Management of Dental Caries

Adopted by the FDI General Assembly: 1 October 2002 - Vienna

Martin J Tyas (4)
CONSENSUS STATEMENT (2007)

- General Assembly of the World Congress of Minimally Invasive Dentistry
- Members of the Western, Central, and Eastern (US) Caries Management by Risk Assessment (CAMBRA) Coalitions
- ADEA Cariology Special Interest Group

recognize the 2002 FDI Policy Statement … as the current clinical standard for caries management

ELEMENTS OF MINIMUM INTERVENTION

- the dentist as a physician (requires a knowledge of the factors associated with the development of caries)
  - individualised assessment of caries risk
  - appropriate preventive strategies
  - remineralisation/arrest of non-cavitated lesions
- the dentist as a surgeon (requires a knowledge of the caries lesion)
  - minimum surgical intervention of cavitated lesions
  - appropriate maintenance of existing restorations
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  - appropriate maintenance of existing restorations
MULTIFACTORIAL NATURE OF CARIES

- Local factors
  - saliva (quality; quantity)
  - diet
    - carbohydrate intake
    - frequency of exposure to acids
  - exposure to fluoride
  - plaque accumulation and retention

- Modifying factors
  - dental history
  - medical history
  - lifestyle
  - socio-economic status
  - compliance
‘TRAFFIC LIGHT’
RISK ASSESSMENT MODEL

- ‘traffic light’ system
  - colours convey levels of risk
  - already used in dentistry, health education, food labelling
  - allocates a threshold value for each risk category
  - for caries, 16 criteria in five categories
GC (JAPAN) ‘TRAFFIC LIGHT’ SYSTEM

- saliva
  - five criteria
- diet
  - # of CHO exposures/day
  - # of acid exposures/day
- fluoride exposure
  - past and current
- plaque
  - three criteria
- modifying factors
  - five criteria
SALIVA AND DENTAL CARIES
SALIVA COMPOSITION

- 99% water
- bicarbonate (buffers to pH 6.7 – 7.4)
- inorganic ions (e.g., calcium, phosphate for remineralisation)
- enzymes: amylase, lipase, proteases, nuclease
- mucins (lubrication; clear bacteria)
- antibacterials (e.g., IgA, enzymes)
FUNCTIONS OF SALIVA

- lubrication
- taste (by dissolving ions)
- health of oral mucosa (promotes wound healing)
- assists digestion
- dilutes/clears material (e.g., carbohydrate)
- buffers plaque and dietary acid
- reservoir for calcium and phosphate
ASSESSMENT OF SALIVA (FIVE CRITERIA)

- unstimulated
  - minor salivary gland function
  - viscosity
  - pH
- stimulated
  - flow rate
  - buffering capacity
- GC Saliva Test kit
MINOR SALIVARY GLAND FUNCTION

- evert lower lip
- dry with gauze
- measure time for droplets to appear at minor salivary gland orifices
- single ply tissue may help

1. Degree of Hydration

> 60 s
30 – 60 s
< 30 s
VISCOSITY

- open mouth; check for pooling of saliva
- lift tongue to palate; check for appearance and shiny film on floor of mouth
- web test: normal = 20 – 50 mm

Thick, ropy, frothy, extended web test
No visible pooling; a little sticky
Watery with pooling; shiny thin film
RED OR YELLOW LIGHT!

- causes of defective function
  - severe dehydration
  - medication
  - hormonal imbalance
  - salivary gland pathology
- dribble into container
- insert pH paper
- read after 10 s
FLOW RATE

- chew on paraffin wax for 5 minutes
- collect saliva
- measure volume
  - wide variation among individuals
  - mean 1.6 mL/min

After 5 min:

- < 3.5 mL
- 3.5 – 5 mL
- > 5 mL
BUFFERING CAPACITY

- ability to neutralise acid
- depends on level of bicarbonate
- use saliva collected for flow rate
- use test strip as directed
- assess against colour standard

<table>
<thead>
<tr>
<th>GC</th>
<th>IVOCLAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 5</td>
<td>Low</td>
</tr>
<tr>
<td>6 – 9</td>
<td>Moderate</td>
</tr>
<tr>
<td>10 – 12</td>
<td>High</td>
</tr>
</tbody>
</table>
### Saliva Test Results

**Name of patient:** MR CHAIWAT SATHORN

**File reference:**

**Date of Test:** 15-FEB-2009

<table>
<thead>
<tr>
<th>Resting saliva</th>
<th>Stimulated saliva</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> Hydration</td>
<td><strong>Step 2</strong> Viscosity</td>
</tr>
<tr>
<td>&gt; 60 secs</td>
<td>sticky frothy</td>
</tr>
<tr>
<td>30-60 secs</td>
<td>frothy bubbly</td>
</tr>
<tr>
<td>&lt; 30 secs</td>
<td>waterly clear</td>
</tr>
</tbody>
</table>

**Step 5 Buffering:**
- Green: 10-12 points
- Yellow: 6-9 points
- Red: 0-5 points

**Step 4 Quantity:**
- Green: > 5.0 ml
- Yellow: 3.5 ml-5.0 ml
- Red: < 3.5 ml

**Step 2 Viscosity:**
- Green: Frothy
- Yellow: Bubbly
- Red: Sticky

**Step 1 Hydration:**
- Green: > 60 secs
- Yellow: 30-60 secs
- Red: < 30 secs

**Step 3 pH:**
- Green: 6.8-7.8
- Yellow: 6.0-6.6
- Red: 5.0-5.8
GC (JAPAN) ‘TRAFFIC LIGHT’ SYSTEM

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  - # of acid exposures/day
- fluoride exposure
  - past and current
- plaque
  - three criteria
- modifying factors
  - five criteria
DIET: FREQUENCY OF CARBOHYDRATE INTAKE

- high CHO intake
  - immediate 2-4 point pH ↓
    (depends on bacteria, plaque thickness, salivary buffering)
  - pH recovery; 20 min – hours
DIET: FREQUENCY OF EXPOSURE TO ACIDS

- non-bacterial acid sources
  - intrinsic acid (e.g., gastric reflux, bulimia)
  - extrinsic acid (e.g., black cola drinks, ‘sports’ drinks)
- caries
- ‘erosion’ (corrosion)
**ASSESSMENT OF DIET**

<table>
<thead>
<tr>
<th># CHO EXPOSURES BETWEEN MEALS</th>
<th># ACID EXPOSURES BETWEEN MEALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 2</td>
<td>&gt; 3</td>
</tr>
<tr>
<td>&gt; 1</td>
<td>&gt; 2</td>
</tr>
<tr>
<td>Nil</td>
<td>1</td>
</tr>
</tbody>
</table>
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- saliva
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  - five criteria
CLINICAL EFFECTS OF FLUORIDE

- remineralisation of incipient enamel caries (‘white spot’ lesion)
- slow down/partly remineralise carious dentine in cavitated lesion
- remineralise root caries lesion
  ➔ ➔ hypermineralisation
- most effective for smooth-surface caries
## Exposure to Fluoride

<table>
<thead>
<tr>
<th>Exposure to Fluoride</th>
<th>Water OR toothpaste</th>
<th>Water AND toothpaste</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil</td>
<td>Red</td>
<td>Green</td>
</tr>
<tr>
<td>Water OR toothpaste</td>
<td>Yellow</td>
<td></td>
</tr>
<tr>
<td>Water AND toothpaste</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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  - past and current
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- modifying factors
  - five criteria
ASSESSMENT OF BIOFILM (PLAQUE)

- Plaque Check (GC Corporation)
  - thickness/maturity
    - 2-colour disclosing gel
      - pink = thin, new plaque
      - blue = thick, mature plaque
  - sucrose challenge and resultant pH
Plaque Test

The convincing solution for the exposure of plaque

Illuminating the Plaque
- Apply Plaque Test generously to the surfaces of the teeth
- Ask the patient to rinse
- Illuminate the teeth with a polymerisation lamp. Any areas affected by plaque appear brightly fluorescent.

Convince
your patients of the need for better oral hygiene measures.

Advantages:
- Fluoresce under every curing light
- No discolouration of tongue or mucous membranes
- Easy handling
- Targeted application
- Economical use

Instruct
your patients where and how to perform these measures.

Thoroughly remove the now visible plaque via tooth brushing or professional tooth cleaning.

Protect
your patients from avoidable dental and periodontal disease.

Delivery form
1 Bottle
Plaque Test, 10 ml
Accessory

Ivoclar Vivadent

Plaque Test is a fluorescent disclosing liquid for the exposure of plaque.
‘CRT Buffer’, ‘CRT Bacteria’ (Ivoclar Vivadent)
MODIFYING FACTORS (5)

1. dental history
   - active caries lesions
   - restorations (past or current risk?)

2. medical history
   - numerous medications → xerostomia, e.g., antidepressants; hypotensives; anticholinergics; antipsychotics; diuretics; anti-Parkinson

3. lifestyle
   - caffeine, alcohol (diuretics)
   - smoking (effect on saliva)
MODIFYING FACTORS (5)

4. socio-economic status (SES)
   - low SES may indicate low educational level, thus low level of understanding
   - financial issues
     - cost of treatment
     - cost of accessing treatment

5. compliance; depends on
   - patient attitude
   - practicality/appropriateness of treatment plan
ASSESSMENT OF MODIFYING FACTORS

- any drugs (OTC/Rx/recreational) which reduce salivary flow?
- any diseases which result in dry mouth?
- fixed/removable appliances?
- recent active caries?
- poor compliance?

| YES to any ONE above |  
|---------------------|---
| NO to all above     | └---

Thai Dental Association  
June 2009

Martin J Tyas (38)
DAVID – AGED 24

- lives in unfluoridated town
- labourer on building site ➔ not well educated
- works outdoors in hot climate ➔ potential dehydration
- drinks low pH black cola drinks (‘Coca Cola’)
- frequent refined CHO intake
- poor oral hygiene
- poor attitude (parents F/F)
DAVID – AGED 24

- diet (high acid; high CHO) - ●
- fluoride exposure (nil) - ●
- plaque (thick) - ●
- dental history (poor attender) - ●
- SES (low) - ●
- attitude and compliance (poor) - ●
- challenges

➢ risk factors: red ➔ green
# DAVID – AGED 24

<table>
<thead>
<tr>
<th>Modifier</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saliva</td>
<td>●</td>
</tr>
<tr>
<td>Plaque</td>
<td>●</td>
</tr>
<tr>
<td>Diet</td>
<td>●</td>
</tr>
<tr>
<td>Fluoride</td>
<td>●</td>
</tr>
<tr>
<td>Modifying factors</td>
<td>●</td>
</tr>
</tbody>
</table>
**CARIOGRAM SCORE CARD**

<table>
<thead>
<tr>
<th>Input site on program</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caries experience (number of cavities per mouth)</td>
<td>0 = No carious, no restorations</td>
</tr>
<tr>
<td>Relative general diseases (identifiable problems that can indirectly influence the oral health)</td>
<td>0 = Healthy</td>
</tr>
<tr>
<td>Diet content (diet history; quality of diet)</td>
<td>0 = Very low fermentable carbohydrate diet</td>
</tr>
<tr>
<td>Diet frequency (frequency of intake of fermentable carbohydrate)</td>
<td>0 = Maximum 3 meals/week or less</td>
</tr>
<tr>
<td>Amount of plaque (percentage of available surfaces covered by plaque)</td>
<td>0 = Less than 5% covered with plaque</td>
</tr>
<tr>
<td>Salivary buffering capacity (using buffer capacity or pH)</td>
<td>0 = Adequate, saliva pH &gt; 6.0</td>
</tr>
<tr>
<td>Clinical judgement (presence of harmful bacteria, absence of other factors that lead to caries)</td>
<td>0 = Good prognosis</td>
</tr>
</tbody>
</table>

**FREQUENCY OF INTAKE OF FERMENTABLE CARBOHYDRATE**
www.db.od.mah.se/car/cariogram/cariograminfo.html
AGED CARE FACILITY
'RADIATION CARIES'

Dr MA Stacey, University of Melbourne

Martin J Tyas (46)
Elements of Minimum Intervention

- The dentist as a physician (requires a knowledge of the factors associated with the development of caries)
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The diagram illustrates the 'DEMIN-REMIN' cycle, which describes the process of dental enamel mineralization and demineralization. It shows the critical pH values for HA (hydroxyapatite) and FA (fluorapatite) dissolution and remineralization.

- **DEMINERALISATION**
  - pH 6.0: H+ reacts with PO₄⁻⁻ in saliva and plaque.
  - pH 5.5: HA dissolves; FA forms if F⁻ present.
  - pH 5.0: FA reforms.
  - pH 4.5: FA and HA dissolve.

- **REMINERALISATION**
  - pH 4.0: If H+ neutralised, and Ca++ and PO₄⁻⁻ present, FA and HA reform.

The diagram highlights the importance of pH levels in controlling the dissolution and remineralization of dental enamel, with specific critical pH values for HA and FA dissolution.
FACTORS PROMOTING ‘REMIN’

- pH > 5.5
- phosphate ions
- calcium ions
- fluoride ions
Clinical use of calcium phosphates for remineralization not successful

- ‘insoluble’ calcium phosphates
  - low solubility (particularly with F)
  - not easily applied nor effectively localized at tooth surface
  - require acid for solubility to produce remineralizing ions

- soluble calcium phosphates
  - can only be used at low concentrations
  - do not effectively localize at tooth surface
CALCIUM PHOSPHOPEPTIDE-AMORPHOUS CALCIUM PHOSPHATE

- casein phosphopeptide-amorphous calcium phosphate (CPP-ACP)
- 25+ years research by Reynolds et al. (Melbourne Dental School, University of Melbourne)
- based on milk protein
- ‘Recaldent’™ (Cadbury Schweppes)
CLINICAL APPLICATIONS OF CPP-ACP

- CPP-ACP products
  - ‘Recaldent’ chewing gum
  - ‘Tooth Mousse’/ ‘MI Paste’ (GC, Japan)
  - addition to glass-ionomer cement (Mazzaoui, Tyas et al.)
  - ↑ compressive strength
  - ↑ bond strength to dentine
  - current work: addition to other GICs (Burrow et al.)
Clinical study of enamel de- and re-mineralization by chewing gum

- 2720 subjects (≈ 12.5 y old)
- Normal use of fluoride toothpaste, fluoridated water
- Sugar-free gum containing CPP-ACP; control gum
  - randomly assigned, double blinded
- Gum chewed 3 x daily for 2 years
- Standardized digital radiographs at baseline and 24 months
- Caries progression/regression analyzed using a transition matrix

Morgan et al. (2006) J Dent Res
Clinical study of enamel de- and re-mineralization by chewing gum

Recaldent in sugar-free gum

- significantly slowed progression
- promoted regression (remineralization)
  ➔ of dental caries relative to a control sugar-free gum in school children
  ➔ in an optimally fluoridated city
  ➔ and using fluoride-containing toothpaste

Morgan et al. (2006) J Dent Res
MI PASTE
CONCLUSION

Recaldent™ (CPP-ACP) technology
- remineralizes enamel subsurface lesions *in situ*
- slows the progression of coronal caries
- promotes regression of caries

CPP-ACP plus F (Tooth Mousse Plus)
- is a superior form of fluoride
- should be clinicians’ first choice
  - for the prevention of caries and erosion
  - for the treatment of dentinal hypersensitivity
  - for the repair of ‘white spot’ lesions
RESIN INFILTRATION

- infiltration of non-cavitated lesions by low viscosity polymerisable resin
- ‘Icon’; DMG Co, Hamburg
- several published laboratory studies
- clinical studies in progress
Icon®
Caries Infiltration. Made by DMG.
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GV BLACK

- extensive research on amalgam (Dental Cosmos, 1896)
- A Work on Operative Dentistry in Two Volumes (1908)

Greene Vardiman BLACK (1835-1915)
BLACK’S TEACHINGS

- highly formalised cavity designs; precise size and geometry
- weak, non-adhesive materials
- ‘extension for prevention’
A Work on Operative Dentistry in Two Volumes (5th Ed, 1922)

Fig. 123.

Fig. 124.

Fig. 125.

Fig. 126.

Fig. 127.

Fig. 128.

Fig. 129.

Fig. 130.
‘SURGICAL MODEL’ (≈ 1900 - 1980s)

• caries can be ‘cured’ by excision of all decayed tooth structure, and replacement with a filling material
• now known to be incorrect
STRUCTURALLY WEAKENED TOOTH

+ 

NON-ADHESIVE RESTORATIVE MATERIAL

HIGH INCIDENCE OF SUBSEQUENT TOOTH FRACTURE
WHAT’S CHANGED?

- enhanced understanding of the carious process
  - an infectious disease
  - demineralisation/remineralisation cycle
- recognition of the rôle of fluoride
  - inhibiting demineralisation
  - enhancing remineralisation
- development of adhesive materials
  - glass-ionomer cement
  - resin-based materials
MINIMUM INTERVENTION IN OPERATIVE DENTISTRY (1990s ONWARDS)

- remineralisation of non-cavitated lesions
- arrest of active lesions
- restoration (surgical treatment) only if required for plaque control or aesthetics
  - removal of caries only (‘infected dentine’)
  - restoration with adhesive materials
- repair of defective restorations
INDICATIONS FOR RESTORATION
(‘SURGICAL APPROACH’)

- cavitation rendering plaque control unachievable
- aesthetics unsatisfactory
- function compromised
‘ADHESIVE’ PREPARATIONS

- conservative cavity
  - macromechanical retention not required
- reduction in microleakage
  - reduced incidence of secondary caries
  - reduced marginal staining
  - reduced pulp damage
- restoration of tooth strength
DENTINE CARIES (Fusayama; Massler)

- ‘infected’ (outer carious) dentine (A)
  - moist, soft, pale yellow
  - heavy bacterial load
  - collagen degraded
  - non-remineralisable

- ‘affected’ (inner carious) dentine (B)
  - dry, hard, brown/black
  - few or no bacteria
  - collagen cross-links intact
  - remineralisable
# TREATMENT OF CARIOUS DENTIN
## EXCAVATION TECHNIQUES

<table>
<thead>
<tr>
<th>Method</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual excavation</td>
<td>Accepted procedure</td>
</tr>
<tr>
<td>Rotary excavation</td>
<td>‘Gold standard’ – but should be modified</td>
</tr>
<tr>
<td>Controlled selective rotary excavation</td>
<td>Experimental</td>
</tr>
<tr>
<td>torque control handpiece</td>
<td></td>
</tr>
<tr>
<td>polymer burs</td>
<td></td>
</tr>
<tr>
<td>Sono-abrasion</td>
<td>Experimental</td>
</tr>
<tr>
<td>Air abrasion</td>
<td>Experimental</td>
</tr>
<tr>
<td>Chemo-mechanical excavation</td>
<td>Limited applications</td>
</tr>
<tr>
<td>Enzymatic digestion</td>
<td>Experimental</td>
</tr>
<tr>
<td>Laser photo-ablation</td>
<td>Experimental</td>
</tr>
</tbody>
</table>

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# Treatment of Carious Dentin

## Disinfection Techniques

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ozone</td>
<td>Primary root caries, more research for other applications</td>
</tr>
<tr>
<td>Photodynamic therapy</td>
<td>Promising</td>
</tr>
<tr>
<td>Antibacterial therapy</td>
<td>Adjunctive to other methods</td>
</tr>
</tbody>
</table>

## Sealing Techniques

<table>
<thead>
<tr>
<th>Material</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluoride-releasing materials</td>
<td>Limited acceptance</td>
</tr>
<tr>
<td>Dentin adhesives</td>
<td>Promising</td>
</tr>
<tr>
<td>Antibacterial materials</td>
<td>Promising</td>
</tr>
</tbody>
</table>


Martin J Tyas (77)
EXCAVATE WITH FIRM PRESSURE UNTIL HARD, DRY, DARK COLOUR
PRINCIPLES OF MINIMUM INTERVENTION RESTORATIONS

- remove only degraded enamel and ‘infected’ dentine
- leave ‘affected’ dentine
- support undermined enamel by the adhesive restorative material
- the cavity shape is dictated by the caries and is unique
- Black’s ‘formal’ cavity designs are obsolete
John Tomes (1859)

‘it is better that a layer of discoloured dentine should be allowed to remain for the protection of the pulp rather than run the risk of sacrificing the tooth’
When removing caries make the enamel-dentine junction hard
Excavate demineralized dentine over the pulpal surface to the level of firm dentine provided there is no likelihood of pulpal exposure
Deep lesions, in symptomless vital teeth, should be gently excavated. Soft demineralized dentine may remain where its removal might expose the pulp
Where it is not possible to remove soft, infected dentine (perhaps the patient is anxious or not cooperative), seal in the infected dentine. A permanent restoration is placed. Do not re-enter
In a symptomless, vital tooth, this should have a high success rate.
Treatment of deep carious lesions by complete excavation or partial removal
A critical review

Van Thompson, DDS, PhD; Ronald G. Craig, DMD, PhD; Fredrick A. Curro, DMD, PhD;
William S. Green, AB; Jonathan A. Ship, DMD

Results. The results of three randomized controlled trials, one of which followed up patients for 10 years, provide

Several additional studies have demonstrated that cariogenic bacteria, once isolated from their source of nutrition by a restoration of sufficient integrity, either die or remain dormant and thus pose no risk to the health of the dentition.
ADHESIVE MATERIALS

- resin composite
  - highly effective to enamel
  - questionable to dentine
  - excellent mechanical properties

- glass-ionomer
  - highly effective to enamel
  - highly effective to dentine
  - brittle
GLASS-IONOMER CEMENTS

- significant properties in minimum intervention dentistry
  - achieves reliable adhesion
  - may prevent secondary caries
  - may remineralise affected dentine
M. J. Tyas, in Mount 2002
MINIMAL INTERVENTION APPROACHES

- occlusal surfaces
  - fissure sealant
  - ‘preventive resin restoration’
- posterior approximal surfaces
  - ‘tunnel’ and ‘internal’ preparations
  - ‘slot’ preparations
PREVENTIVE RESIN RESTORATION

Dr Hien Ngo
Adelaide

Martin J Tyas (88)
FISSUROTOMY BURS
THE APPROXIMAL CAVITY
E1
OUTER HALF OF ENAMEL

E2
INNER HALF OF ENAMEL

D1
JUST INTO DENTINE

D2
OUTER 1/3 OF DENTINE

D3
INNER 2/3 OF DENTINE

APPLY TOPICAL FLUORIDE AND MONITOR

DO NOT RESTORE WITHOUT FURTHER CONSIDERATION

RESTORE NOW
EVOLUTION OF THE APPROXIMAL CAVITY

‘TUNNEL’ AND ‘INTERNAL’ PREPARATIONS
TUNNEL AND INTERNAL PREPARATIONS

- access through marginal fossa to approximal caries
- maintains marginal ridge
- tunnel preparation
  - cavity ‘exits’ into approximal space
- internal preparation
  - demineralised approximal enamel retained
CLINICAL CAVITATION AND RADIOGRAPHIC APPEARANCE

Bille & Thylstrup, Caries Res 1982;16:1-6
INTERNAL PREPARATION
INTERNAL PREPARATION

≥ 1.5 mm
CONDITION (PAA)

WASH; DRY; PLACE S/C GIC

INTERNAL PREPARATION

INTERNAL
INTERNAL PREPARATION

APPLY BOND; BLOW THIN; CURE;
PLACE COMPOSITE; (PLACE SEALANT); CURE; APPLY
NEUTRAL FLUORIDE
TUNNEL PREPARATION

AFFECTED DENTINE

GIC

COMPOSITE

≥ 3 mm
TUNNEL PREPARATION
CLINICAL REVIEW OF ‘TUNNEL’ AND ‘INTERNAL’ RESTORATIONS

- 15 clinical trials in permanent teeth reviewed
- 57 – 90% success up to 3 years
- main reasons for failure
  - caries
  - marginal ridge fracture
- placement of resin composite over GIC does not increase fracture resistance of marginal ridge
- failure in one study
  - 3 y – 10%; 5 y – 65%

Wiegand & Attin, Dent Mater 2007;23:1461-1467
CLINICAL REVIEW OF ‘TUNNEL’ AND ‘INTERNAL’ RESTORATIONS

- median survival times
  - GIC tunnel – 6 y
  - resin composite approximal – up to 9 y
  - amalgam approximal – up to 13 y

- annual failure rate
  - GIC tunnel – 7-10%
  - GIC approximal – 7-10%
  - resin composite approximal – 2.3%
  - amalgam approximal – 3.3%

Wiegand & Attin, Dent Mater 2007;23:1461-1467
factors affecting success

- tooth type, lesion size, tunnel or internal: equivocal data on influence on performance
- preservation of approximal enamel in internal preparation may support ridge, BUT
- complete caries removal more difficult to assess in internal preparation

strong operator influence

- 9 – 50% failure among 12 dentists
- median survival 40 – 65 mo among 5 dentists

Wiegand & Attin, Dent Mater 2007;23:1461-1467
CLINICAL REVIEW OF ‘TUNNEL’ AND ‘INTERNAL’ RESTORATIONS

• influence of caries activity
  ➔ conflicting data on success v caries activity
  ➔ one trial: higher failure of GIC restorations (no resin composite over GIC) in high caries active patients

Wiegand & Attin, Dent Mater 2007;23:1461-1467
OVERALL CONCLUSION

- clinical success may be related to
  - mechanical strength of cavity
  - characteristics of restorative material
  - operator skill
  - patient caries activity
- demanding procedure requiring practice
  - rubber dam; lighting; magnification

Wiegand & Attin, Dent Mater 2007;23:1461-1467
SLOT PREPARATION

Lasfargues et al.

Martin J Tyas (112)
ELEMENTS OF MINIMUM INTERVENTION

- the dentist as a physician (requires a knowledge of the factors associated with the development of caries)
  - individualised assessment of caries risk
  - appropriate preventive strategies
  - remineralisation/arrest of non-cavitated lesions
- the dentist as a surgeon (requires a knowledge of the caries lesion)
  - minimum surgical intervention of cavitated lesions
  - appropriate maintenance of existing restorations
MANAGEMENT OF DEFECTIVE RESTORATIONS
RESTORATION REPLACEMENT

• about 60% of a general practitioner’s time is spent replacing restorations
• most frequent reason is secondary caries
• replacement results in
  ➔ larger cavity
  ➔ damage to adjacent teeth
  ➔ increased risk of more complex restorations
  ➔ new defects introduced
DIAGNOSIS OF SECONDARY CARIES


- only amalgam restorations with marginal defects > 0.4 mm wide should be replaced (Kidd et al., J Dent Res 1995;74:1206)
OPTIONS FOR MANAGEMENT

- recontour and/or polish
- fissure seal margins
- repair local defect
- replace restoration

INCREASINGLY INVASIVE
SOME INDICATIONS FOR RESTORATION REPLACEMENT

• extensive secondary caries
  ➔ cannot be removed in a repair procedure
• aesthetic need
• pulpal pathology
• fixed prosthodontic procedure
OPERATIVE DENTISTRY

TWENTIETH CENTURY (GV BLACK)

‘Extension for prevention’

TWENTY-FIRST CENTURY

‘Prevention of extension’
Preservation and Restoration of Tooth Structure

2nd Edition

Graham J. Mount  W.R. Hume

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