Minimally Invasive Caries Management Techniques

Healthy Smiles for Kids of Orange County

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Handouts: conservativedentalsolutions.com   INFO/PORTAL/HSOC2018
Goals & Learning Objectives

- Review latest evidence supporting minimally invasive caries management
- Explore World Health Organization approaches to managing caries in under-developed regions (ART)
- Translate World Health Organization’s caries management and restorative techniques to modern dental settings (ART & ITR)
- ...explain to colleagues and patients how Atraumatic Restorative Treatment (ART) & Caries Arrest Treatment differ from conventional techniques
- ...describe the clinical appearance and behavioral characteristics of hardening glass ionomer cements at gel stage, initial set, and maturation
- ...list at least two indications & two contraindications for placing Interim Therapeutic Restorations using Atraumatic Restorative Treatment principles
Conflicts of Interest & Bias Disclosure

- Presenter received research funding from and directed "New Technologies" GC Corporation 1992-2001
- VOCO Dental provided funding support for this presentation
- Presenter voluntarily evaluates donated dental products for various dental manufacturers
- Clinical Consultant: CMP Industries, Regulatory Compliance
Nels Ewoldsen DDS, MSD
Conservative Dental Solutions
Waveland, Indiana (population 420)
Parke County Indiana: Covered Bridge Capital of the World; Fall Foliage Festival October 12-21, 2018
Download handouts .......
What Is Minimally Invasive Caries Management?

- tissue preservation
- disease prevention
- intercepting disease progress
- removing and replacing as little tissue as possible
- re-creating tissue

......’M. I.’ it does not suggest we make small fillings to restore incipient lesions.

The current surgical emphasis with artifact placement/replacement is driven by reimbursement.

D. Ericson Oral Health Prev Dent 2004
We can re-create enamel:
- acid dissolution
- abrasion
- re-precipitation
H₃PO₄ acid rub

Then remineralize with Remin Pro
Caries Arrest: SDF remineralization of caries affected dentin

Intercept disease
<table>
<thead>
<tr>
<th>“Black”</th>
<th>vs</th>
<th>Minimally Invasive (MID)</th>
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</thead>
<tbody>
<tr>
<td>◇ Outline Form follows Black’s observations (anatomical features, functional loading, access/visibility)</td>
<td>◇ Follow the extent of caries lesion, remove only caries infected tissues</td>
<td>◇ Macro-mechanical and/or chemical adhesion of restoration</td>
</tr>
<tr>
<td>◇ Macro-mechanical restoration retention (extension for retention)</td>
<td>◇ PREVENTION of extension (Exemption from extension)</td>
<td>◇ Pulp vitality preservation</td>
</tr>
<tr>
<td>◇ Extension for prevention</td>
<td></td>
<td>- use of antimicrobial agents (CHX, F)</td>
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<tr>
<td>◇ Resistance form/functional durability</td>
<td></td>
<td>- partial caries removal</td>
</tr>
<tr>
<td>◇ Pulp vitality preservation</td>
<td></td>
<td>- stepwise caries removal/caries detection</td>
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**HOW NECESSARY ARE METALLIC RESTORATIONS?**

**ARE ACRYLIC RESIN FORMULATIONS CARIOINDUCTIVE?**

Caries Excavation & the Pulp-dentin Complex

- Complete vs Partial (incomplete) Caries Removal
- Stepwise Caries Removal
- Rotary vs Alternative Techniques (Excavator, Slow speed, High speed, Chemomechanical, Airborne Particle Abrasion, Laser)
- Atraumatic Restorative Treatment (GIC)
- Base? -chemically adhesive water-based cement
- Liner? -chemically adhesive water-based cement OR acrylic resin
- Pulp Cap? -calcium hydroxide (hard setting)
- Mineral Trioxide Aggregate (MTA)
Caries Excavation & the Pulp-dentin Complex

- Complete vs Partial (incomplete) Caries Removal
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- Rotary vs Alternative Techniques (Excavator, Slow speed, High speed, Chemomechanical, Airborne Particle Abrasion, Laser)

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  - Base? - chemically adhesive water-based cement
  - Liner? - chemically adhesive water-based cement OR acrylic resin
  - Pulp Cap? - calcium hydroxide (hard setting, thin layer)
  - Mineral Trioxide Aggregate (MTA)
#13, 65 Q, hepatic hypertension, Xerostomia, asymptomatic tooth #13, Chief complaint: “food trap”
Restorative material/technique options

Ian Schuman DDS, (Advanced Minimally Invasive Techniques) IonoLux Open Sandwich Technique, Dental Economics 2017
How did we get HERE & where do we go NOW?

Minimally invasive caries management techniques: Transformation of G.V. Black restorative principles into minimally invasive caries management to address a caries
Is there a caries epidemic in the US today?

Early childhood caries (ECC); Severe ECC (S-ECC)

ECC = caries prior to 71 months; S-ECC = any smooth surface lesion @ 3 yrs

Early Childhood Caries (40%) & Severe Early Childhood Caries (20% 2-5 year olds)
Early Childhood Caries & Severe Early Childhood Caries

- Caries is a biofilm-induced acid demineralization of enamel/dentin modulated by saliva

- ECC is the presence of 1 or more [caries lesion], missing or filled surface prior to 5th year

- Up to the age of 3, any sign of smooth surface caries

- From ages 3-5, one or more [caries lesion] in maxillary anteriors ......or

- DMF > age of the child (up to age 6) constitutes S-ECC

taken from American Academy Pediatric Dentistry: Definition Early Childhood Caries
Defining *Interim Therapeutic Restoration (ITR) & Sedative filling*

◊ ADA Glossary of terms: A sedative filling is a *restoration intended to relieve pain*

◊ Current Dental Terminology  CDT 2015

  **D2940** “Protective restoration, not to be used as a base or liner under a restoration.”

  **D2941** “Interim Therapeutic Restoration (ITR), primary dentition”

◊ American Academy Pediatric Dentistry (AAPD 2004-2013 Policy Statement ITR): a provisional technique to *restore & prevent the progression of dental caries* in young patients, uncooperative patients with special health care needs, and [when] traditional dental restorations are not feasible. *ITR may be used for caries control in children with multiple carious lesions prior to definitive restoration*

◊ Academy of Operative Dentistry, American College of Prosthodontics, American Academy of Endodontics………no definition yet

◊ Indian Health Service ([www.ihs.gov](http://www.ihs.gov)) “Mighty Mouth Fillings” IHS/ECC Collaboration “an interim therapeutic restoration (ITR) is placed on teeth to prevent the progression of caries”
Tooth Decay (Caries) is a *bacteria-mediated* process resulting in subsurface demineralization, cavitation of tooth surface and advancing destruction toward the pulp.

Advanced caries (65% RDT) = pulpitis

Reversible pulpitis = *sensitivity to cold or sweets* (short duration discomfort)

*Lingering pain upon exposure to heat or spontaneous pain at night*—irreversible pulpitis

*Percussion tenderness* suggests dental abscess (dead, infected tissue)

*Sharp pain* when chewing suggests either a cracked tooth or dental abscess.
Sedative filling: management of reversible pulpitis

- insults associated with microleakage, recurrent or continuing caries, high-speed cutting & other thermal insults

Zinc oxide & eugenol

Berman MH JADA 1959 p97
Protective Restoration (Sedative Filling)  VS  Interim Therapeutic Restoration
D2940  D2941

- Direct placement of restorative material to protect tooth and/or tissue, to relieve pain, promote healing, or prevent further deterioration.

- Not to be used for endodontic access closure or as a base or liner under restoration.

primary dentition

- Placement of an adhesive restorative material following caries debridement by hand or other method for the management of early childhood caries.

- Not considered a definitive restoration.
Controlling acute caries using ‘sedative fillings’ (D2940)
Caries debridement completed, ART technique with
2% Chlorhexidine solution applied
IonoStar Plus ‘Sedative Fillings’ (Pulp Protective Restorations)
Tray set-up for ITR treatment

IonoStar Molar = HV GIC (conventional)

IonoStar Plus = esthetic GIC (conventional)

Ionolux = VLA GIC (light cured)
In deciduous teeth ........

Interim Therapeutic Restoration: ITRs (D2941)
Protective Restoration: (D2940)
ITRs reduce levels of cariogenic bacteria in the oral cavity; hand-instrument excavation, debridement
GIC restorations
Highly viscous GICs bond to caries debrided enamel and dentin
American Academy of Pediatric Dentistry
- young, uncooperative, special care patients, ECC

- differentiate ITRs from ART restorations

- contemporize ART with follow up, dental home

- similar techniques, different therapeutic goals

- reductions in oral levels of Mutans Streptococci, lactobacilli (6 month benefit)

- single surface, small two surface restorations

- follow up care (topical F and OHI)
An atraumatic restorative treatment (ART) technique: evaluation after one year.
Frencken JE, Songpaisan Y, Phantumanvanit P, Pilot T.

Extraction is the most common dental treatment in rural and suburban areas in less-industrialized countries, restorative care is rarely provided

Atraumatic Restorative Treatment (ART) technique, follows the concept of minimal intervention, does not require electrically driven equipment.
Hand excavation of carious lesions
using glass-ionomer cement as a filling material and a sealant.

Longevity of fillings/sealants placed using the technique in rural Thailand.
- caries was treated using the ART technique in one village
- population in a second village received restorative care (amalgam fillings)
- third village was the control

79% of single surface ART fillings, 55% of ART fillings of greater than one surface in deciduous teeth were judged successful after 1 year.

ART filling success in the permanent dentition was 93%. Retention rate for sealants was 78%.

Children were pleased at having received treatment by this technique, showed little fear.
UNMC Student Project: 1996-1999
Prior to ITR Policy, AAPD’s Alternative Restorative Treatment (ART)

-Differentiate "Alternative" vs "Atraumatic"

-Planned follow up including topical fluorides & OHI
Non-rotary caries debridement

Airborne Particle Abrasion

How much tooth preparation is sufficient?
D1352 Preventive resin restoration:

- classification high-risk for caries
- active caries, removed by the dentist
- composite restoration placed
- all susceptible ‘adjacent’ pits & fissures simultaneously sealed
Airborne particle abrasion selectively removes carious enamel and dentin without rotary instruments.

Finger-pressed GIC restoration shown at 33 months in service.
Fill/seal restorations “press-finger” placed @ 8 years (#31) and at 2 years (#30)
Glass ionomer sealants differ from resin sealants in loss pattern characteristics.
GIC Sealants: Zone of protection

- Effects of a glass-ionomer cement on the remineralization of occlusal caries – an *in situ* study
  - Human 3rd molars, (2) 30 day evaluations, sealed with Delton or Fuji IX.
  - Protection/remineralization zone: 125 µm

*Brazil Oral Res 2006; 20(2) :91-6 Amaral, et al*
Learning A.R.T. Technique:

- Manual dexterity, clinical knowledge, GIC properties/behaviors, occlusion & tooth form
- Assessing the oral environment, pulp status (periodontium), caries
- Identifying & accessing the lesion, spoon excavation “ringing sound”
- Cleaning the cavosurface margin, conditioning/rinsing
- Preparing the GIC mix, isolation
- Placing & contouring the GIC, functional generation of occlusion
- Maintaining hydration, applying surface protection
Periodontal Assessment:
- fistula
- granuloma
- tooth mobility

Evaluate pulp vitality using clinical signs of necrosis......as well as radiographic assessment when possible
Do not activate capsule until mix-time
Combine liquid/powder by depressing orange plunger then immediately place in capsule mixer and mix for 10 sec. (3400 cps)
Summary of Clinical Steps

- assess intraoral conditions, classify caries risk, consider ITRs when caries lesions are accessible, likely to worsen before dentist visit

- assess periodontal conditions & pulp status, inform patient caries removal is frequently completed without local anesthetic

- begin with large spoon at cavosurface margin, work toward the center of the lesion

- cease excavating pulpally when the patient expresses discomfort

- establish a smooth, clean cavosurface margin, apply cavity conditioner for 15 sec.

- rinse, blot cavity preparation dry, control saliva and prepare GIC mix

- deliver GIC mix to the deepest areas first then overfill and use pressed-finger placement

- functionally shape the occlusal (bite) and carve/contour immediately after gel stage

- confirm occlusion, polish & apply surface protection to extend clinical service life
The setting reaction of glass-ionomer
Mixing & Setting of a Highly Viscous Glass Ionomer Cement

Fresh mix

Early gel stage

Dulling indicates polyacid depletion

Early set

Dehydration

IonoStar Molar, VOCO
Caries Arrest Treatment

- Topical fluoride, Fluoride Varnish
- Silverdiamine fluoride
- Silverdiamine fluoride with potassium iodide
Silverdiamine fluoride (SDF)

Two minute application, 30-40% solution, pH = 9.0 rinsed for 30 seconds


Knight GM, et al Inability to form s mutans biofilm on SFD/KI treated dentin, Quint Int. 2009: 40(2) 155-61
AAPD chairside guidelines for management of dental caries lesions

Chairside Guide: Silver Diamine Fluoride in the Management of Dental Caries Lesions

Dental caries affects about one in four children aged 2-5 years. Silver diamine fluoride (SDF) has been shown to be efficacious in arresting caries lesions and is a valuable therapy which may be included as part of a caries management plan for patients. Carioca lesions treated with SDF usually turn black and hard. Stopping the caries process in all targeted lesions may take several applications of SDF and magnification may be necessary in certain areas.

Case selection for application of silver diamine fluoride
Patients who may benefit from SDF include:
- With high caries risk who have active carious caries lesions in anterior or posterior teeth;
- Presenting with behavioral or medical management challenges and untreated caries lesions;
- With multiple untreated caries lesions that may not all be treated in one visit;
- With dental caries lesions that are difficult to treat and without access to or with difficulty accessing dental care.

Carioca lesion selection includes:
- No clinical signs of pulpal inflammation or reports of tenderness/sensitivity/pain;
- Carious lesions that are not progressing on the pulp. If possible, radiographs should be taken to assess depth of carious lesions;
- Carious lesions on any surface as long as they are accessible with a brush for applying SDF. Orthodontic separators may be used to help gain access to proximal lesions.
- SDF can be used prior to restoration placement as part of caries control therapy. Informed consent, particularly highlighting expected staining of oral tissues, potential staining of skin and clothes, and need for repigmentation for aesthetic purposes.

Clinical application of silver diamine fluoride:
- Remove gross debris from carious lesion to allow better SDF contact with the dentin.
- Carioca lesion excision prior to SDF application is not usually necessary. Agitation may reduce proportion of amalgam caries lesions that become black, but may be considered for aesthetic purposes.

A protective coating may be applied to the lips and skin to prevent temporary discoloration that can occur if self-tissue come into contact with SDF.

Isolate areas to be treated with cotton rolls or other isolation methods. If applying cavity varnish or any other product to protect surrounding gingival tissue, take care to not inadvertently coat the surface of the caries lesion.

Carious should be taken when applying SDF on primary teeth adjacent to permanent anterior teeth that may have non-carious (white spot) lesions to avoid misalignment staining.

Careful application with a microbrush should be adequate to prevent transient and external soft tissue exposure. No more than one drop of SDF should be used for the entire appointment.

Dry lesion with gentle flow of compressed air.

Brush teeth with a rounded brush. Dip brush into SDF and dab on the side of the plastic dispenser to remove excess liquid before application. Apply SDF directly to the affected tooth surface. Remove excess SDF with gauze, cotton roll, or suction to minimize systemic absorption.

Application time should be at least one minute if possible. (Application time likely will be shorter in very young and difficult to manage patients. When using shorter application periods, monitor carefully to prevent patient and other use to evaluate and consider re-application.)

Apply gentle flow of compressed air until medication is dry. Try to keep isolated for as long as possible.

The entire dentition may be treated after SDF treatment with five percent sodium fluoride varnish to help prevent caries on the teeth and sites not treated with SDF.

Annual SDF reapplication is at least 60% effective in preventing lesion progression.

Silver nitrate treated carious root lesions 6 mos after 30 sec 12% + F varnish
Silverdiamine Fluoride staining, as well as Silver Nitrate staining can be minimized by following the 30 second ‘silver’ application (25%-40% solution wt/v) with a 30 second application of potassium iodide
Caries arrest treatment using silver diamine fluoride + potassium iodide

Staining may be reversed by gentle polishing with tincture of iodine (weak iodine solution).
Similarly prepared carious teeth restored with GIC, stored in artificial saliva for 22 months.

Potassium Iodide (KI) flush of Silver diamine fluoride (SDF) treated cavity.

Photos courtesy Dr. GM Knight.
Silverdiamine fluoride (38% applied for 1 min) followed by 15% potassium iodide for 30 sec
Advantage Arrest Silverdiamine Fluoride (38%) applied for 30 seconds then rinsed with AWS
Potassium Iodide (10-15% solution) applied for 30 seconds
Effect of polyols (sugar alcohols) on oral microflora

Sweeteners including sorbitol, manitol, polyerythritol, xylitol (lower caloric value compared to ‘sugars’, metabolic end product = alcohol)
Habitual Consumption of Xylitol

- total daily consumption 5-6 g xylitol (1 g/piece of gum) with total exposure time of 15 minutes may reduce S. mutans and caries

- xylitol resistant S. mutans?

- side effects include occasional reports of diarrhea, esp. in children
Caries reduction in children whose mothers received the following interventions

- F gel
- F varnish
- CHX
- xylitol

% reduction
Partial removal of carious dentine: a multicenter randomized controlled trial and 18-month follow-up results.
Maltz M¹, Jardim JJ, Mestrinho HD, Yamaguti PM, Podestá K, Moura MS, de Paula LM.

Abstract

AIM: The aim of this study was to evaluate the effectiveness of partial removal of carious dentine and restoration in a single session (PDR) and stepwise excavation (SW), both of which are treatments for deep carious lesions, in Public Health Services in Brazil.

METHODS:

INCLUSION CRITERIA: patients ≥6 years old, permanent molars with deep caries lesions (having a radiolucency halfway or more into dentine) and pulp vitality but absence of spontaneous pain, positive percussion test, and periapical alterations. The subjects received either PDR (test group) or SW (control group). The radiological and clinical exams were performed after a mean time of 18 months.

OUTCOMES: success was defined as pulp sensitivity to cold test and absence of periapical alterations.

RESULTS: Of the 299 treatments performed, 146 were SW and 153 were PDR; 122 were amalgam restorations and 168 resin-composite restorations. There were no differences between the groups regarding the baseline characteristics (i.e. age, gender and family income). After 18 months, 212 evaluations were performed, which indicated 99 and 86% success rates in the PDR and SW groups, respectively (p = 0.016). Reasons for failure were: PDR - 1 pulpitis; SW - 8 pulpitis; 1 osteitis; 4 necrosis; 1 endodontic treatment. None of the baseline variables were significantly associated with the outcomes.

CONCLUSION: The retention of carious dentine does not interfere in pulp vitality. Data from this 18-month study suggest that the procedure of reopening the cavity to remove the residual infected dentine is not necessary.

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Painting the future for ART.
Holmgren CJ¹, Frencken JE.
¹Faculty of Dentistry, The University of Hong Kong, Hong Kong. holmgren@club-internet.fr

Abstract
The objective of this paper is to review recent research and developments with respect to the atraumatic restorative treatment (ART) approach and to outline future areas of research and development. Areas identified as requiring further investigation include the evaluation of: ART restorations for longer than 3 years duration using recognised evaluation criteria, multi-surface ART restorations, ART restorations in primary teeth and ART sealants. In addition, the possibility and potential dangers of caries remaining after cavity cleaning with hand instruments must be investigated and the findings balanced against the known damage to sound tooth tissue caused by more routine cavity preparation techniques. New bioactive restorative materials which offer the possibility of healing dentinal caries lesions should be developed and evaluated. Finally, behavioural and educational aspects of the ART approach should be investigated.
The residual caries dilemma.

Weerheijm KL1, Groen HJ.

Abstract

Restorative dentistry is based on the assumption that bacterial infection of demineralized dentine should prompt operative intervention. One of the concepts of practical dentistry is to create a favourable environment for caries arrest with minimal operative intervention. The progress of remaining primary caries is key to any discussion of this concept. This discussion is important for the atraumatic restorative treatment (ART) approach, since the removal of all carious dentine is sometimes difficult using hand instruments only. In this paper the results of possible measures to guard against the effects of residual carious and its consequences are reviewed, in order to obtain an impression of the justification for (in)complete excavation of occlusal dentinal caries. Three types of measure are considered: isolating the caries process from the oral environment, excavating the carious dentine, and using a cariostatic filling material. Each of these measures contributes to the arrest of the caries process. However, none of these measures can arrest this process by itself. A combination of all three seems necessary. It is concluded that although residual caries does not seem to be the criterion for rerestoration, one has to strive for as complete caries removal as possible. If this cannot be fulfilled the sealing capacities of the filling material seem to be more important than its cariostatic properties.
Is ART really atraumatic?
van Amerongen WE¹, Rahimtoola S.

Abstract
Atraumatic restorative treatment (ART) is an approach to the management of carious lesions that uses only hand instruments to remove carious tissue and to restore the tooth involved. The name ART implies that the approach is atraumatic to both the patient and the tooth. This study set out to evaluate whether ART is atraumatic in terms of both patient discomfort and tooth tissue conservation. Three hundred and fifty-nine patients were divided in two groups: one group was treated with hand instruments and the other with rotary equipment. Each patient received two restorations: one using amalgam and one using glass ionomer as the restorative material, placed without the use of anaesthesia. Less discomfort was reported with the ART approach compared to conventional restorations made using rotary instruments and amalgam. Moreover, preparations with hand instruments were smaller than those produced with rotary instruments. Reported discomfort was associated with the size of the preparation, although the influence of the operator on both criteria was considerable. A patient effect was also observed since patients who reported discomfort during the first treatment were more likely to report discomfort after the second treatment. In conclusion, the choice of the term "ART" as an atraumatic procedure is defensible.
The comparative radiopacity of Fuji IX-GP, an intermediate restorative material.

DuBois DJ¹, Reichl RB, Hondrum SO.

Abstract

The radiopacity of intermediate restorative materials should be sufficient to enable the clinician to distinguish the material from normal and decalcified tooth structure. The purpose of this study was to determine the relative radiopacities of intermediate restorative materials, including a newly introduced high-viscosity, self-cured, condensable glass ionomer material. Radiographs were made of six intermediate restorative materials: two reinforced zinc oxide-eugenol materials (IRM and Zinroc), a conventional glass ionomer material (Ketac-fil), a synthetic resin material (Cavit), a eugenol-free zinc oxide material (Tempit), and a new, general-purpose, condensable glass ionomer material (Fuji IX-GP). Optical density was measured using a densitometer. The optical density of dentin and enamel were used for radiographic comparison. Statistical analysis revealed significant differences among materials: Cavit = IRM = Tempit > Zinroc = Fuji IX-GP > Ketac-fil = enamel > dentin (where > indicates a statistical difference at p < or = 0.05). Although not as radiopaque as some other intermediate materials tested, the radiopacity of Fuji IX-GP appears sufficient to aid diagnosis.

Success of an alternative for interim management of irreversible pulpitis.
McDougal RA, Delano EO, Caplan D, Sigurdsson A, Trope M.

Abstract

BACKGROUND:
Extraction and endodontic therapy are treatment options for irreversible pulpitis. Extraction often is chosen for financial reasons. The authors conducted a study to investigate an alternative interim therapy.

METHODS:
The authors recruited patients (N = 73) with irreversible pulpitis and whose teeth were restorable but who opted for extraction owing to financial reasons. After undergoing pulpotomy, the teeth were restored by random assignment with one of two intermediate restorative materials: Caulk IRM (Dentsply Caulk, Milford, Del.) (Group I, n = 38) or an IRM base with glass ionomer core (Fuji IX GP, GC America, Alsip, Ill.) (Group II, n = 35). The authors monitored the teeth over six and 12 months for pain, integrity of restoration and radiographic periapical status by densitometric analysis.

RESULTS:
By six months, 10 percent of subjects remaining in the study (Group I, n = 27; Group II, n = 25) reported pain; by 12 months, 22 percent (Group I, n = 22; Group II, n = 18) reported pain. A two-tailed Fisher exact test showed no significant difference (P > or = .05) between groups at either time interval. No apical radiographic change was noted in 49 percent of teeth at six months (Group I, n = 18; Group II, n = 19) and 42 percent at 12 months (Group I, n = 16; Group II, n = 15). Chi2 analysis demonstrated no significant differences (P > or = .05) between groups. Seven of 22 restorations in Group I and four of 18 in Group II required repair at 12 months with no statistical difference (chi2 analysis, P > or = .05).

CONCLUSIONS:
The interim treatment of eugenol pulpotomy using either restorative material reliably prevented pain for six months. For longer periods, both restorations may require repair.

CLINICAL IMPLICATIONS:
This option should preserve the integrity of the arch and extend the use of the tooth while the patient finds the means to finance complete endodontic treatment.
Atraumatic perspectives of ART: psychological and physiological aspects of treatment with and without rotary instruments.

Schriks MC¹, van Amerongen WE.

Abstract

Atraumatic Restorative Treatment, ART, is a method of minimal caries intervention that uses only hand instruments. The aim of the present study was to explore a possible difference between the extent of discomfort experienced during dental treatment according to the ART approach and a method using rotary instruments. The study was performed in Indonesia. A total of 403 children were randomly divided in two groups. In each child, one class II restoration in a deciduous molar was made. One group received treatment using rotary instruments (750 r.p.m.). The other group was treated according to the ART approach. Glass ionomer cement was used for restoration in both groups. Discomfort scores were determined using both physiological measurements (heart rate) and behavioral observations (Venham) on specific moments during the treatment. Venham scores showed a marked difference between the two groups at most time points. Heart rate measurements were different at deep excavation. Also, a clear relation between Venham scores and heart rate measurements could be found at all time points. Confounding could be shown for operating dentist, gender of the patient and initial anxiety, not for age. No effect modification could be shown. It can be concluded that children treated according to the ART approach using hand instruments alone experience less discomfort than those treated using rotary instruments.

Comment in

• Atraumatic restorative techniques could reduce discomfort in children receiving dental treatment. [Evid Based Dent. 2005]
Abstract
A pragmatic randomised controlled trial comparing a minimally invasive approach based on atraumatic restorative treatment (ART) procedures (test) was tested against the standard-care approach (control) to treat early childhood caries (ECC) in a primary-care setting in Perth, W.A., Australia. Parent/child dyads with ECC were allocated to the test or control group using stratified block randomisation. Children were examined at baseline and follow-up by two calibrated examiners blinded to group allocation status. Dental therapists trained in ART provided treatment to the test group and dentists treated the control group. Restoration quality was evaluated at follow-up using the ART criteria. Data were analysed on an intention-to-treat basis; test of proportions, Wilcoxon rank test and logistic regression, controlling for clustering of teeth, were used. Two hundred and fifty-four children were randomised (test = 127 and control = 127). There was no statistically significant difference in age, sex and baseline caries experience between the test and control groups. At follow-up (mean interval 11.4 months, SD 3.1), 220 children were examined (test = 115 and control = 105) and 597 teeth (test = 417 and control = 180) were evaluated for restoration quality, of which 16.8% (test) and 6.7% (control) were judged to have failed (required replacement; p < 0.01). Intention-to-treat, multiple logistic regression found multisurface restorations (OR = 10.4) had significantly higher odds of failure, while referral for specialist paediatric care had significantly lower odds of restoration failure (OR = 0.2). The ART-based approach enabled more children and teeth to be treated, and multisurface restoration and treatment in a primary-care setting had higher odds of restoration failure.
Abstract

PURPOSE:
To directly compare the survival rates of three incomplete caries removal techniques that differed in the amount of caries removal and the base material used.

METHODS:
Ninety-six primary molars with asymptomatic deep caries or reversible pulpitis were randomly assigned to three groups: (1) indirect pulp treatment (IPT); (2) minimal caries removal with both resin-modified glass ionomer base material and luting cement (MCRB/L); and (3) minimal caries removal with only resin-modified glass ionomer luting cement (MCRL). The treatments were followed clinically and radiographically for two years.

RESULTS:
The two-year survival probabilities in the IPT, MCRB/L, and MCRL groups were 0.90 (95 percent confidence interval [CI] equals 0.73 to 0.97), 0.93 (95 percent CI equals 0.76 to 0.98), and 0.77 (95 percent CI equals 0.58 to 0.89), respectively. There was no significant difference in the two-year survival probabilities of the three studied groups (generalized Wilcoxon P=.07).

CONCLUSIONS:
Following two years, neither the amount of caries removal nor the base material affected the success of incomplete caries removal treatment. However, minimal caries removal with MCRB/L presented the highest survival rate among the tested groups and resulted in no incidence of pulp exposure.
Effects of glass ionomer temporary restorations on pulpal diagnosis and treatment outcomes in primary molars.

Coll JA, Campbell A, Chalmers NI.

Abstract

PURPOSE:
To evaluate 1) if glass ionomer interim temporary restorations (ITR) placed for 1-3 months prior to vital pulp therapy (VPT) improved accuracy of diagnosing the pulp's clinical status and subsequent VPT success, and 2) the effect of the location of the carious lesion on VPT.

METHODS:
Primary molars (N=117) receiving pulp therapy with or without ITR were evaluated retrospectively. All teeth had caries extending >50 percent into dentin; caries lesion location was identified (proximal or non-proximal). Two examiners rated pulp status assessment, caries location, and pulp treatment, and correlated treatment outcomes after a mean of 34.7 months to these factors.

RESULTS:
VPT failed more often in first primary molars (P<.001) than in second primary molars. Using ITR improved diagnosis of the pulp status, clinical success of VPT, (P=.013) and first molar VPT success (P=.02). First primary molars had more proximal lesions than second molars (P<.001). Failure of VPT was greater for teeth with proximal lesions (P=.03). Use of ITR significantly improved VPT in teeth with proximal lesions (P=.007) but not non-proximal lesions (P=.38).

CONCLUSIONS:
ITR placed prior to VPT improved pulpal diagnosis and VPT outcomes. Vital pulp therapy was less successful in primary molars with proximal lesions, and ITR significantly improved the success.
Histological evaluation to study the effects of dental amalgam and composite restoration on human dental pulp: an in vivo study.

Chandwani ND¹, Pawar MG, Tupkari JV, Yuwanati M.

Author information

Abstract

OBJECTIVE:
To study and compare the effects of dental amalgam and composite restorations on human dental pulp.

MATERIALS AND METHODS:
One hundred sound premolars scheduled for orthodontic extraction were divided equally into two groups: group A, teeth restored with silver amalgam, and group B, teeth restored with composite resin. Each group was equally subdivided into two subgroups [extracted after 24 h (A-1 and B-1) or 7 days (A-2 and B-2)], and the histological changes in the pulp related to the two different materials at the two different intervals were studied.

RESULTS:
It was found that after 24 h, the inflammatory response of the pulp in teeth restored with amalgam and composite was similar (p = 1.00). However, after 7 days, the severity of the inflammatory response of the pulp in teeth restored with amalgam was less compared to that in teeth restored with composite (p = 0.045).

CONCLUSION:
This study confirmed that amalgam continues to be the mechanically as well as biologically more competent restorative material. Composite could be a promising restorative material to satisfy esthetic needs for a considerable period of time. However, its biological acceptance is still in doubt.
Clinical and radiographic outcomes of partial caries removal restorations performed in primary teeth.

Dalpian DM, Ardenghi TM, Demarco FF, Garcia-Godoy F, De Araujo FB, Casagrande L.

Abstract
PURPOSE:
To analyze the outcomes of partial caries removal (PCR) restorations in primary teeth.

METHODS:
The sample of this retrospective study comprised primary teeth that had been treated with PCR by undergraduate students and were selected from the dental records of patients who were receiving treatment at the School of Dentistry, Federal University of Rio Grande do Sul - Brazil (UFRGS), from 2007 to 2012. Records containing clinical and/or radiographic follow-up data of restorations with PCR in primary teeth were included in the analysis. Factors potentially associated with treatment failure were investigated, such as the number of surfaces restored, type of capping material and restorative material used, the presence of visible plaque, and the gingival bleeding index.

RESULTS:
The sample comprised 254 teeth in 118 subjects; the follow-up period ranged from 1 to 50 months. The overall success rate for PCR was 80.3% (204/254). A significant association was found between high final visible plaque index and PCR failure (P = 0.002)
Is Atraumatic restorative treatment an option for restoring occlusoproximal caries lesions in primary teeth? A systematic review and meta-analysis.

Raggio DP¹, Hesse D, Lenzi TL, Guglielmi CA, Braga MM.

Abstract

BACKGROUND:
Atraumatic restorative treatment (ART) has demonstrated good longevity when used for single-surface restorations, but lower success rates are reported for occlusoproximal surfaces.

AIM:
This systematic review and meta-analysis aimed to verify the pooled success rate of occlusoproximal ART restorations in primary teeth considering the outcomes: longevity, pulp damage, or caries lesion progression.

DESIGN:
Literature searching was carried out on the studies reporting clinical trials indexed in PubMed and in English language, comprising the outcomes. A meta-analysis was undertaken considering the results from reviewed studies.

RESULTS:
An initial search resulted in 126 articles, and three of them were finally selected. The main reasons for excluding articles were the absence of control group, as amalgam, composite resin, or compomer restorations to be compared with ART (hand excavation + high-viscous GIC). The pooled estimate (odds ratio; 95% confidence interval) for ART approach success was 1.04 (0.65-1.66).

CONCLUSION:
Atraumatic restorative treatment restorations performed with high-viscous GIC present similar survival/success rates to conventional approach using composite resin or amalgam for occlusoproximal restorations in primary teeth and can be suggested as a good option for occlusoproximal cavities in primary molars. In addition, further randomized controlled clinical investigations concerning occlusoproximal restorations in primary teeth are still necessary.
Incomplete caries removal: a systematic review and meta-analysis.
Schwendicke F1, Dörfer CE, Paris S.

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Erratum in

Abstract
Increasing numbers of clinical trials have demonstrated the benefits of incomplete caries removal, in particular in the treatment of deep caries. This study systematically reviewed randomized controlled trials investigating one- or two-step incomplete compared with complete caries removal. Studies treating primary and permanent teeth with primary caries lesions requiring a restoration were analyzed. The following primary and secondary outcomes were investigated: risk of pulpal exposure, post-operative pulpal symptoms, overall failure, and caries progression.

Electronic databases were screened for studies from 1967 to 2012. Cross-referencing was used to identify further articles. Odds ratios (OR) as effect estimates were calculated in a random-effects model. From 364 screened articles, 10 studies representing 1,257 patients were included. Meta-analysis showed risk reduction for both pulpal exposure (OR [95% CI] 0.31 [0.19-0.49]) and pulpal symptoms (OR 0.58 [0.31-1.10]) for teeth treated with one- or two-step incomplete excavation. Risk of failure seemed to be similar for both complete and incomplete excavation, but data for this outcome were of limited quality and inconclusive (OR 0.97 [0.64-1.46]). Based on reviewed studies, incomplete caries removal seems advantageous compared with complete excavation, especially in proximity to the pulp. However, evidence levels are currently insufficient for definitive conclusions because of high risk of bias within studies.
Outcomes of one-step incomplete and complete excavation in primary teeth: a 24-month randomized controlled trial.
Franzon R1, Guimarães LF, Magalhães CE, Haas AN, Araujo FB.

Author information

Abstract

AIM:
To compare 24-month pulp health outcomes of partial caries removal (PCR) and total caries removal (TCR) with composite restoration in primary molars.

METHODS:
48 children aged 3-8 years with at least one molar with a deep carious lesion were included. 120 teeth were randomized to control (TCR; n = 54; 69% class II) and test (PCR; n = 66; 63% class II) groups. Total absence of carious tissue was confirmed using a blunt-tipped probe in the TCR group. For PCR, excavation was stopped when hardened, dried dentin with a leathery consistency was achieved. Pulpotomy was performed in cases of pulp exposure.

RESULTS:
Pulp exposure occurred in 2 and 27.5% of teeth treated with PCR and TCR, respectively (p < 0.01). The operative time was significantly higher for TCR than PCR. Success rates were 92 and 96% in the PCR and TCR groups, respectively (p = 0.34). The success rate tended to be lower in occlusoproximal (92%) than in occlusal (100%) lesions (p = 0.08).

CONCLUSION:
The clinical and radiographic success rates of PCR and TCR in primary teeth with deep carious lesions were high and did not differ significantly, indicating that PCR is a reliable minimally invasive approach in primary teeth and that the retention of carious dentin does not interfere with pulp vitality. Moreover, PCR provided other clinically relevant advantages over TCR, especially lower incidence of pulp exposure and lower operative time.