SofaCON DENTAL SUMMIT

SUPPORTING DENTAL PROFESSIONALS DURING COVID-19 AND BEYOND

Enhancing restoration longevity - clinical tips on material selection, placement and maintenance

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

Ian Meyers

BRISBANE WEST DENTAL GROUP

29th April 2020

EMS ELECTRO MEDICAL SYSTEMS

GC

HENRY SCHEIN®

ADA AUSTRALIAN DENTAL ASSOCIATION

Royal Australasian College of Dental Surgeons
Let knowledge conquer disease

Royal Flying Doctor Service

Oral-B®

Dentsply Sirona

RHONDIUM™

Colgate

3M ESPE

ADIA Australian Dental Industry Association

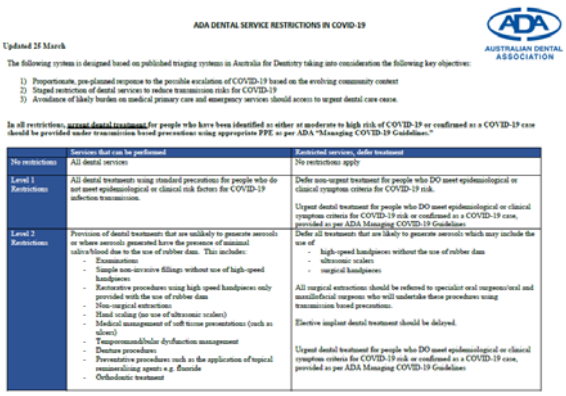
Guidance on Dental Treatment during COVID-19 Pandemic

Australian Health Protection Principal Committee

Coronavirus (COVID-19)
AHPPC STATEMENT

AUSTRALIAN DENTAL ASSOCIATION

Dental Board Ahpra



ADA DENTAL SERVICE RESTRICTIONS IN COVID-19

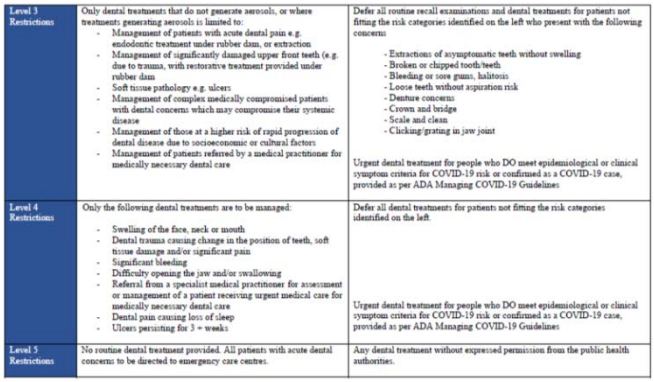
Updated 26 March

The following system is designed based on published triaging systems in Australia for Dentistry taking into consideration the following key objectives:

1) Proportionate, pre-planned response to the possible escalation of COVID-19 based on the evolving community context
2) Staged restriction of dental services to reduce transmission risk for COVID-19
3) Avoidance of likely burden on medical primary care and emergency services should access to urgent dental care cease.

In all restrictions, urgent dental treatment for people who have been identified as either at moderate to high risk of COVID-19 or confirmed as a COVID-19 case should be provided under transmission based precautions using appropriate PPE as per ADA "Managing COVID-19 Guidelines."

	Services that can be performed	Restricted services, defer treatment
No restrictions	All dental services	No restrictions apply
Level 1 Restrictions	All dental treatments using standard precautions for people who do not meet epidemiological or clinical risk factors for COVID-19 infection transmission.	Defer non-urgent treatment for people who DO meet epidemiological or clinical symptom criteria for COVID-19 risk. Urgent dental treatment for people who DO meet epidemiological or clinical symptom criteria for COVID-19 risk or confirmed as a COVID-19 case, provided as per ADA Managing COVID-19 Guidelines
Level 2 Restrictions	Provision of dental treatments that are unlikely to generate aerosols or where aerosols generated have the presence of minimal saliva/blood due to the use of rubber dam. This includes: - Examinations - Simple non-invasive fillings without use of high-speed handpieces - Restorative procedures using high speed handpieces only provided with the use of rubber dam - Non-surgical extractions - Hand scaling (no use of ultrasonic scaler) - Medical management of soft tissue presentations (such as ulcers) - Temporomandibular dysfunction management - Denture procedures - Preventative procedures such as the application of topical remineralising agents e.g. fluoride - Orthodontic treatment	Defer all treatments that are likely to generate aerosols which may include the use of - high-speed handpieces without the use of rubber dam - ultrasonic scalers - surgical handpieces All surgical extractions should be referred to specialist oral surgeons/oral and maxillofacial surgeons who will undertake these procedures using transmission based precautions. Elective implant dental treatment should be delayed. Urgent dental treatment for people who DO meet epidemiological or clinical symptom criteria for COVID-19 risk or confirmed as a COVID-19 case, provided as per ADA Managing COVID-19 Guidelines



Level 3 Restrictions	Only dental treatments that do not generate aerosols, or where treatments generating aerosols is limited to: - Management of patients with acute dental pain e.g. endodontic treatment under rubber dam, or extraction - Management of significantly damaged upper front teeth (e.g. due to trauma, with restorative treatment provided under rubber dam - Soft tissue pathology e.g. ulcers - Management of complex medically compromised patients with dental concerns which may compromise their systemic disease - Management of those at a higher risk of rapid progression of dental disease due to socioeconomic or cultural factors - Management of patients referred by a medical practitioner for medically necessary dental care	Defer all routine recall examinations and dental treatments for patients not fitting the risk categories identified on the left who present with the following concerns: - Extractions of asymptomatic teeth without swelling - Broken or chipped tooth/teeth - Bleeding or sore gums, halitosis - Loose teeth without aspiration risk - Denture concerns - Crown and bridge - Scale and clean - Clicking/grating in jaw joint Urgent dental treatment for people who DO meet epidemiological or clinical symptom criteria for COVID-19 risk or confirmed as a COVID-19 case, provided as per ADA Managing COVID-19 Guidelines
Level 4 Restrictions	Only the following dental treatments are to be managed: - Swelling of the face, neck or mouth - Dental trauma causing change in the position of teeth, soft tissue damage and/or significant pain - Significant bleeding - Difficulty opening the jaw and/or swallowing - Referral from a specialist medical practitioner for assessment or management of a patient receiving urgent medical care for medically necessary dental care - Dental pain causing loss of sleep - Ulcers persisting for 3 + weeks	Defer all dental treatments for patients not fitting the risk categories identified on the left. Urgent dental treatment for people who DO meet epidemiological or clinical symptom criteria for COVID-19 risk or confirmed as a COVID-19 case, provided as per ADA Managing COVID-19 Guidelines
Level 5 Restrictions	No routine dental treatment provided. All patients with acute dental concerns to be directed to emergency care centres.	Any dental treatment without expressed permission from the public health authorities.

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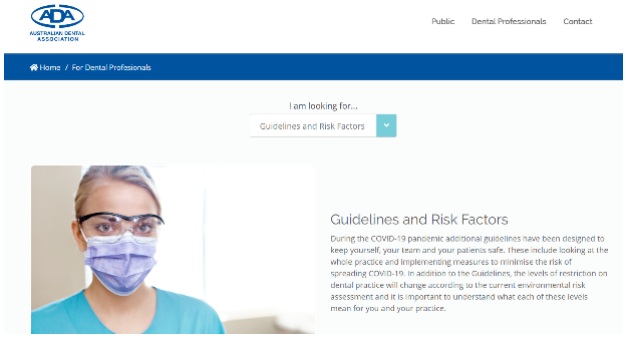
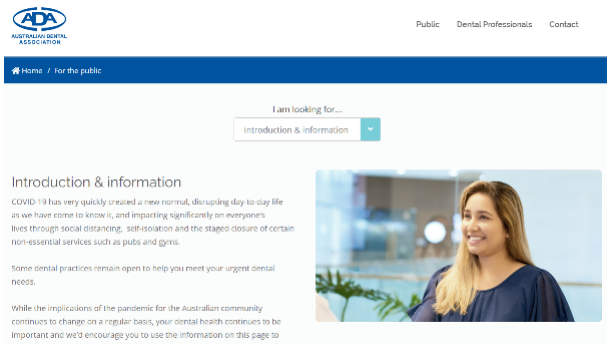
https://www.ada.org.au/Covid-19-Portal/Dental-Professionals



https://www.ada.org.au/Covid-19-Portal/For-the-public



The AHPPC's latest advice and what it means for your practice

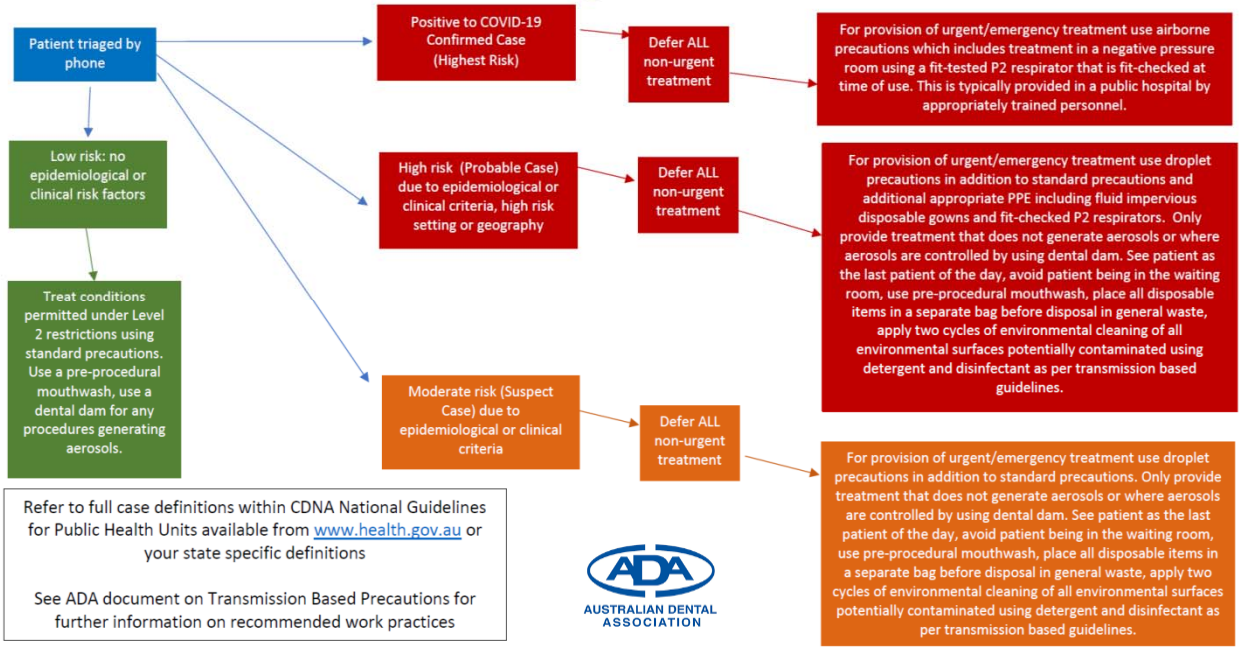
- The PM announced on **21st April** that AHPPC supports the current recommendation by the Australian Dental Association (ADA) that dentists now move to level 2 restrictions.
- The DBA confirmed the advice from AHPPC on 23rd April, and expects all dental practitioners to follow the AHPPC's advice.
- While the emergency response to COVID-19 is a national issue, public health legislation is primarily a power of the states and territories.
- Remember that you must also check with your respective state or territory health department for directives that apply to dental practice, both private and public.
- **Level 2 restrictions do allow a broader range of interventions to be undertaken,** including all dental treatments that are unlikely to generate aerosols, or where aerosols are generated they have the presence of minimal saliva/blood due to the use of rubber dam.

All Dental Practitioners should exercise clinical judgement to determine whether to provide care to patients in the context of:

- The patient's specific dental needs
- The patient's age and overall health
- The ability to provide dental care safely for patients, and the dental team members
- The current COVID-19 situation in your area
- The availability of Personal Protective Equipment (PPE)

Practitioners must apply their clinical and professional judgment on a case by case basis while adopting the COVID-19 Guidelines.

Decision Tree for Level 2 Patient Management



Unlike level 3 restrictions, level 2 restrictions allow some non-urgent dental treatments to be provided, enabling the resumption of many routine dental procedures.

Level 2 Restrictions	Provision of dental treatments that are unlikely to generate aerosols or where aerosols generated have the presence of minimal saliva/blood due to the use of rubber dam. This includes: - Examinations - Simple non-invasive fillings without use of high-speed handpieces - Restorative procedures using high speed handpieces only provided with the use of rubber dam - Non-surgical extractions - Hand scaling (no use of ultrasonic scalers) - Medical management of soft tissue presentations (such as ulcers) - Temporomandibular dysfunction management - Denture procedures - Preventative procedures such as the application of topical remineralising agents e.g. fluoride - Orthodontic treatment	Defer all treatments that are likely to generate aerosols which may include the use of - high-speed handpieces without the use of rubber dam - ultrasonic scalers - surgical handpieces All surgical extractions should be referred to specialist oral surgeons/oral and maxillofacial surgeons who will undertake these procedures using transmission based precautions. Elective implant dental treatment should be delayed. Urgent dental treatment for people who DO meet epidemiological or clinical symptom criteria for COVID-19 risk or confirmed as a COVID-19 case, provided as per ADA Managing COVID-19 Guidelines

Current international data suggests there are likely asymptomatic COVID-19 positive patients in the community, which creates the potential for risk of infection to dental staff and cross-infection between patients. This is why precautions around limiting aerosol-generating procedures continue to be recommended.

Practical Advice for stepping back to Level 2 Restrictions

Last Updated: 23 April 2020

AUSTRALIAN DENTAL ASSOCIATION

- The key principle of level 2 restrictions is the provision of treatments that are unlikely to generate aerosols.
- When aerosol-producing procedures are undertaken, the use of a dental dam is mandatory.
- This condition applies to all oral health practitioners, and for all procedures, including the removal of orthodontic brackets.
- If a dental dam cannot be used, and aerosols need to be produced, then the procedure cannot be provided.

What equipment produces aerosols?

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Aerosols are produced when water and air are mixed.

Dental equipment which is known to produce aerosols includes:

- high-speed handpieces,
- low speed / prophy handpieces,
- triplex syringes when water and air are used together,
- ultrasonic handpieces,
- piezo surgical handpieces,
- hard tissue lasers that use water mist spray,
- particle beam jets / air-polishers,
- air-abrasion units,
- surgical handpieces.

Enhancing Treatment Range by Enhancing Rubber Dam Technique

- Achieving appropriate isolation and good rubber dam technique
- Access vs Isolation (Prevention of contaminated aerosols)
- Single tooth, Multiple teeth, Full arch
- Split Dam techniques
- Caulking agents

Ivoclar Vivadent - Optragate

Ivoclar Vivadent - Optradam

Latest Features | Esthetic Dentistry

10 Steps to Rubber Dam Isolation in Restorative Therapy

Not limited to endodontics, dental dams also offer clinical advantages in restorative dental treatment.

By Mario F. Romero, DDS, John F. Coleman, DMD, Michael Pruett, DMD and Courtney S. Babb, DMD — On **Nov 21, 2019**

Rubber Dam Techniques Practical Demonstration

Presented by Prof Paul Abbott

23 Mins

24 October 2018

Video

https://www.ada.org.au/CPD-Portal

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Enhancing Restoration Longevity by Enhancing Rubber Dam Technique

Cochrane Library

Cochrane Database of Systematic Reviews 2016, Issue 9.

Rubber dam isolation for restorative treatment in dental patients (Review)

Wang Y, Li C, Yuan H, Wong MCM, Zou J, Shi Z, Zhou X

Evidence indicates that the use of a rubber dam increases the survival time of dental restorations compared to the use of cotton rolls as an isolation method.

Unfortunately rubber dam is not always possible or practical !!

When should patients be seen who need treatments where aerosol generation will occur, but the treatment cannot be provided under rubber dam (such as ultrasonic scaling), or if it is not possible to successfully place rubber dam?

Patients requiring dental treatment that will generate aerosols that cannot be minimised with the use of a rubber dam should be advised that their dental treatment will recommence as soon as level 2 restrictions are lifted.

Alternatively undertake a non-aerosol generating procedure

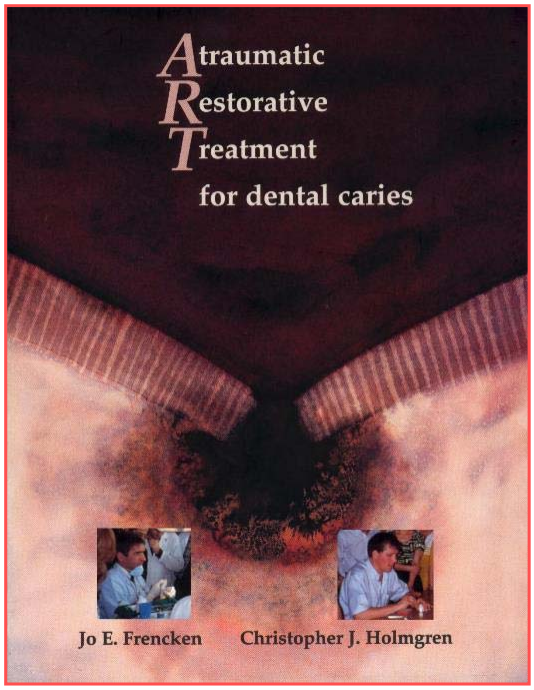
General Principles for Reducing Aerosols and Reducing Risk

For all dental treatment, ensure that you:

- allow sufficient time
- use pre-procedural mouth rinse
- isolate teeth well and disinfect the area
- eliminate / minimise use of equipment that generates aerosols
- use high-speed evacuation

Consider the use of:

- minimally invasive dentistry, and minimum preparation dentistry
- hand instrumentation for cavity preparation
- very low rotating speed for slow speed handpieces
- interim / temporary restorations
- atraumatic restorative treatment



Minimum Intervention

Minimal Preparation

Minimises Time

Minimises Risk

Maximises Outcomes

MANUAL FOR THE ATRAUMATIC RESTORATIVE TREATMENT APPROACH TO CONTROL DENTAL CARIES

Contents

In 1994 GC launched the first Fuji IX in a hand mixed formulation, named Fuji IX to associate it with the 9 aspects related to the ART technique.

Atraumatic restorative treatment and minimal intervention dentistry

J. E. Frencken[1]

BRITISH DENTAL JOURNAL | VOLUME 223 NO. 3 | AUGUST 11 2017

In brief

To update the reader about the level of quality of ART sealants and ART restorations which is no different from that of comparable traditional treatments.

To inform the reader about the importance of Minimal Intervention Dentistry for managing the burden of dental caries in society. One should not forget that dental caries, in essence, is a preventable disease.

To inform the reader that atraumatic care procedures should be given preference over rotary-driven procedures as in doing so the chance for reducing anxiety and discomfort is reduced, access to care increased and oral health improved, particularly in children.

Review

Atraumatic Restorative Treatment and Interim Therapeutic Restoration: A Review of the Literature

Afnan M. Saber [1], Azza A. El-Housseiny [1,2] and Najlaa M. Alamoudi [1,*]

Dent. J. 2019, 7, 28

Both ART and ITR are acceptable strategies, with success rates comparable to the traditional treatment methods.

Management of restorative cases with minimal or no aerosol

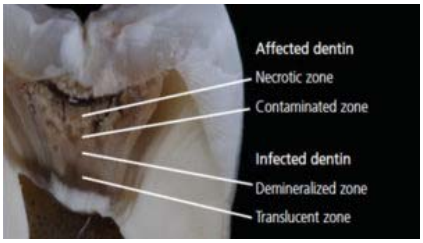
- Pre-procedural mouth rinse
  - Hydrogen Peroxide (1%), Chlorhexidine (0.2%),
  - Povidone Iodine (1%), Essential Oils
- Radiographs as required
- Use of local anaesthetic agents as required
- **Use of isolation techniques to provide isolation and a dry field**
  - Retraction, cotton rolls, dry tips, high volume suction
- Disinfection of operating field (after isolation)
  - Chlorhexidine, Sodium Hypochlorite, Hydrogen Peroxide, Iodine

Management of restorative cases with minimal or no aerosol

- Use of minimally invasive procedures using hand instruments, or slow rotation speed bur to remove caries (and pulp tissue when necessary)
- **Avoid the use of air-turbine handpiece.**
- **Red Band (speed increasing) handpiece may be an option**
  - **allows high speed bur, but run at lower speed (avoid heat generation)**
- **Always use high volume evacuation**
- Use of cotton wool pellets, gauze and cotton wool rolls to clean and dry preparations. (avoid / reduce use of triplex syringe)
- Remove carious and unsupported tooth structure

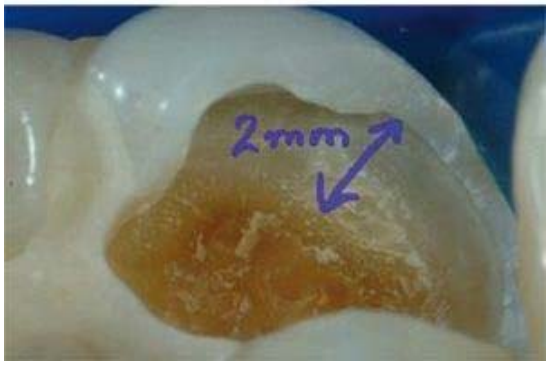
Minimally Invasive Approach

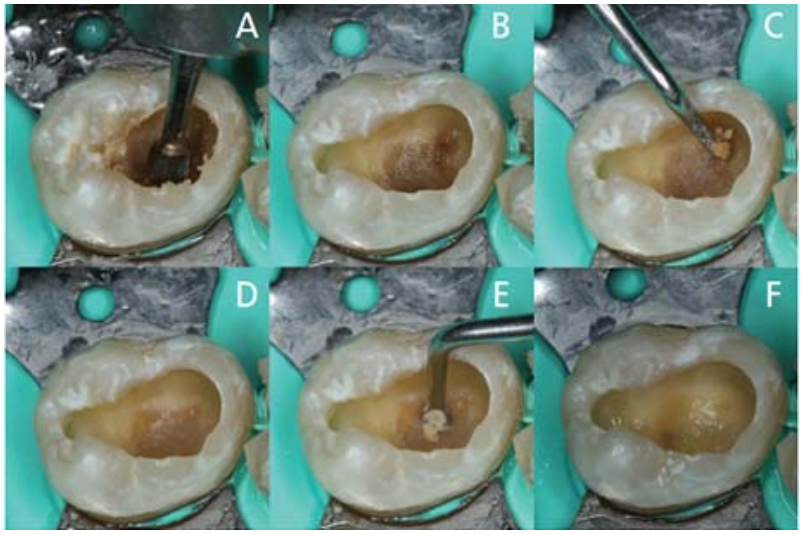
- Remove friable enamel with hand instruments
  - limit removal to that required for restorative access
- Remove only the outer carious ('infected') dentine
  - soft, moist, discoloured dentine should be removed
- Leave inner carious ('affected') dentine
  - hard, dry darkened dentine can be left



Minimally Invasive

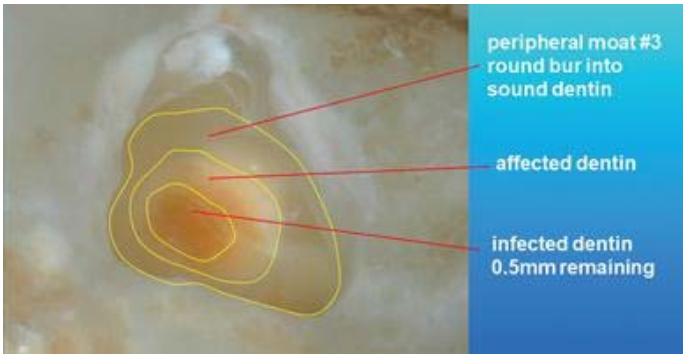
- Remove peripheral caries at the DEJ with excavator
  - **marginal seal is imperative**
- Remove soft dentine from pulpal floor **with largest excavator possible (or large slow speed round bur)**
  - More conservative / self-limiting
  - Better tactile feedback
  - Less aerosol
- **BUT, stop excavating if a pulp exposure is anticipated**

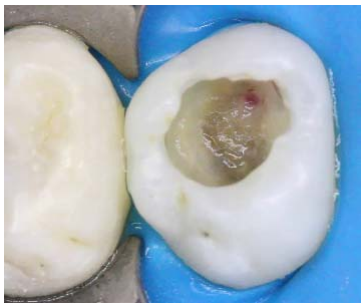




The decision of how much infected dentine to remove is a balance between removing enough carious dentine to obtain a favourable bond and effective seal for the restoration, while maintaining sufficient dentine over the pulp to ensure pulpal health.

Clinical Treatment of Deep Caries, Lawson, N Decisions in Dentistry. 2019;5(2):10-14.





Direct and Indirect Pulp Capping: A Brief History, Material Innovations, and Clinical Case Report. Alex G. Compend Contin Educ Dent. 2018;39(3):182-189.

Hand Instruments for Preparation (No Handpiece)

Hand Instruments for Preparation

ART2
Excavator #2, handle #41

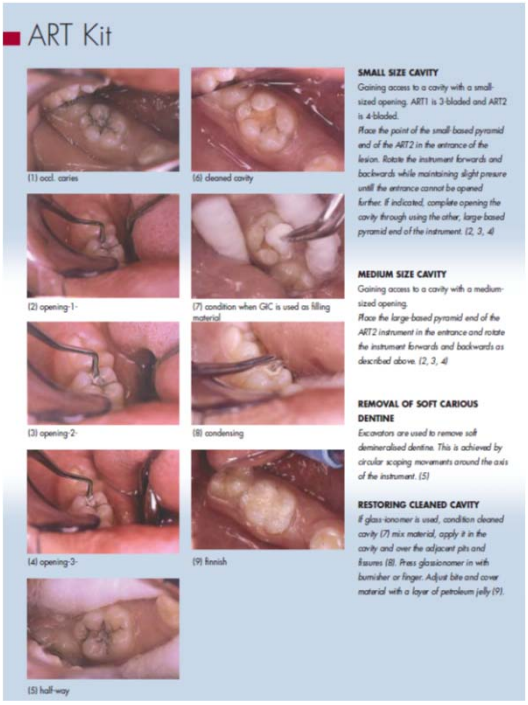
CP53/54
Hatchet Off-Angle #53/54, handle #41, 10-6-12

EXC131/2
Excavator #131/132, handle #41

EXC153/4
Excavator #153/154, handle #41

CE

ART Kit

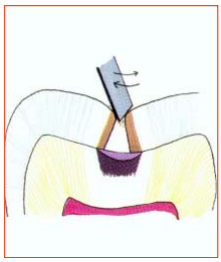


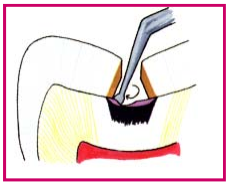
SMALL SIZE CAVITY
Gaining access to a cavity with a small-sized opening. ART1 is 3-bladed and ART2 is 4-bladed.
Place the point of the small-based pyramid end of the ART2 in the entrance of the lesion. Rotate the instrument forwards and backwards while maintaining slight pressure until the entrance cannot be opened further. If indicated, complete opening the cavity through using the other, large-based pyramid end of the instrument. (2, 3, 4)

MEDIUM SIZE CAVITY
Gaining access to a cavity with a medium-sized opening.
Place the large-based pyramid end of the ART2 instrument in the entrance and rotate the instrument forwards and backwards as described above. (2, 3, 4)

REMOVAL OF SOFT CARIOUS DENTINE
Excavators are used to remove soft demineralised dentine. This is achieved by circular scraping movements around the axis of the instrument. (5)

RESTORING CLEANED CAVITY
If glass-ionomer is used, condition cleaned cavity (7) mix material, apply it in the cavity and over the adjacent pits and fissures (8). Press glassionomer in with burnisher or finger. Adjust bite and cover material with a layer of petroleum jelly (9).

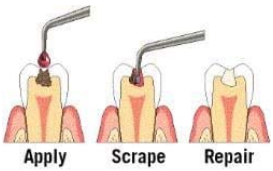


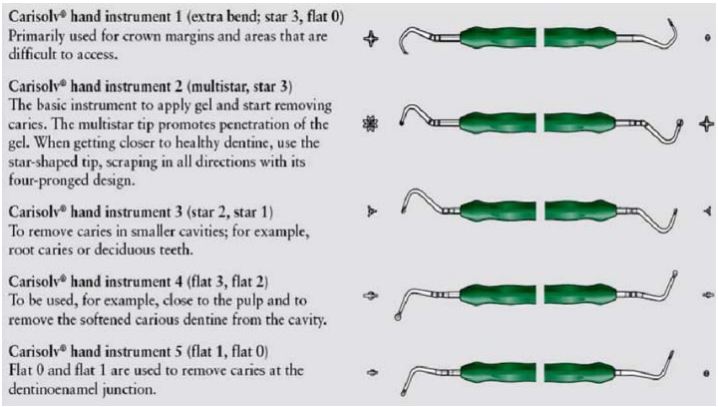


The use of **Carisolv** is a technique used to remove caries and decay with minimal invasive techniques.
It is composed of 0.5% sodium hypochlorite and amino acids

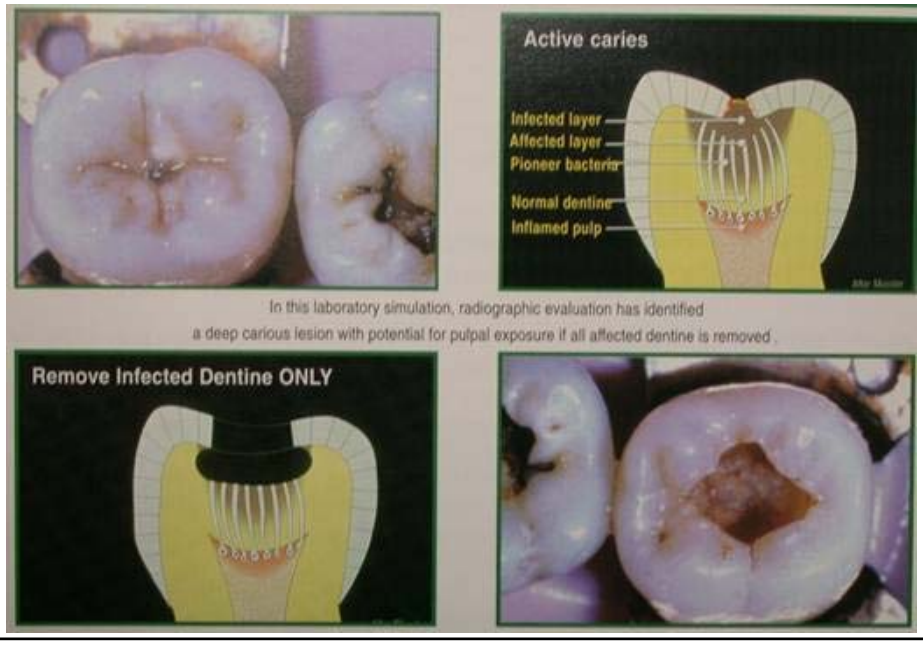
- Hypochlorite (dissolves the decayed dentine).
- Amino acid (buffering solution to prevent damage to the healthy tissue).

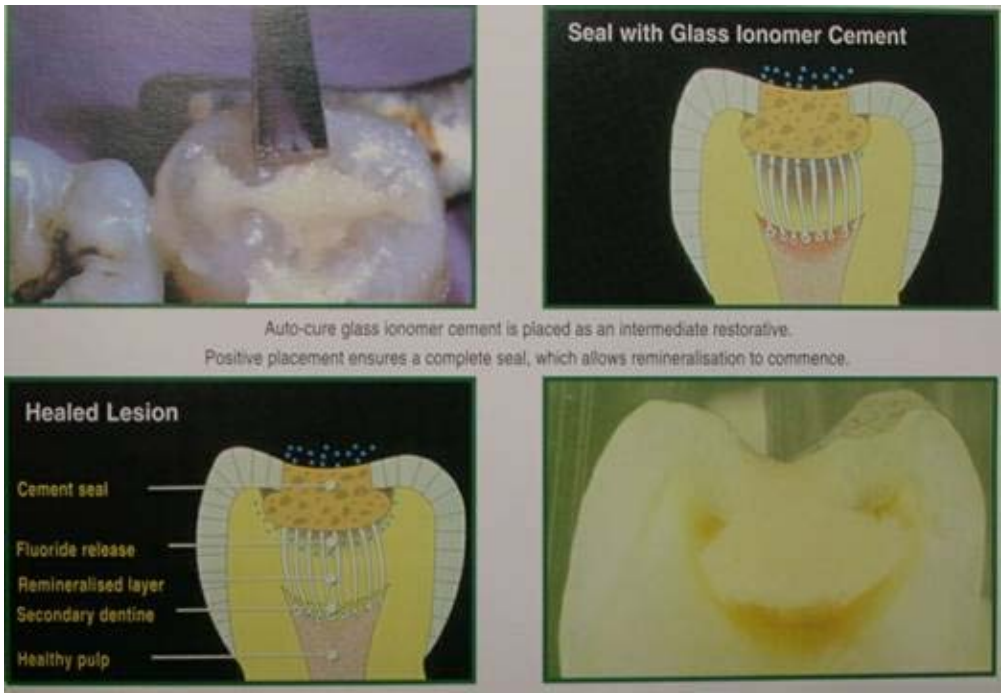
The solution will react with the denatured collagen in infected dentine making it soft and easily removed with hand instruments.





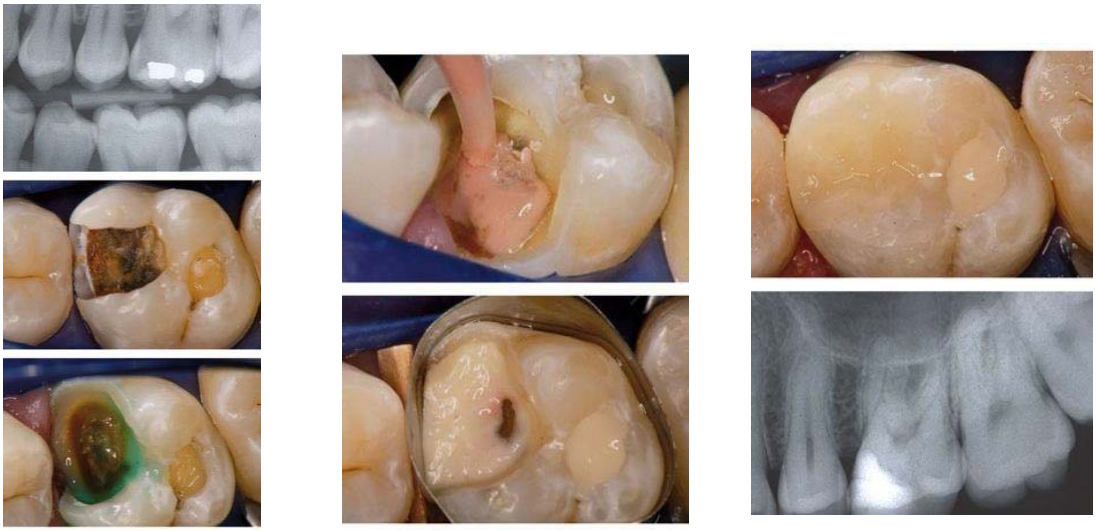
Indirect Pulp Cap Concept





Minimal intervention in cariology: the role of glass-ionomer cements in the preservation of tooth structures against caries

H. Ngo & S. Opsahl-Vital, British Dental Journal 2014, 216:561–565



Etch Vs Conditioner

Etch
- Removes smear layer
- Demineralizes
- Opens dentine tubules

Conditioner
- Removes smear layer
- Minimal mineral removal
- Cleans surface

DENTIN CONDITIONER

Cavity Cleaning Agent

A 10% polyacrylic acid conditioner for smear layer removal and dentine preparation prior to glass ionomer application.

Advantages

- Cleans the dentine surface
- Contributes to ensuring optimal chemical adhesion
- Creates micro-mechanical retention
- Reduces the risk of post operative sensitivity
- Enhances the marginal seal
- Has a blue tint to help with application control
- 20 sec application, followed by rinsing and gentle drying

10%
20 seconds

CAVITY CONDITIONER

Cavity Cleaning Agent

A 20% polyacrylic acid conditioner to remove the smear layer and prepare dentine and enamel surfaces for chemical bonding prior to glass ionomer application.

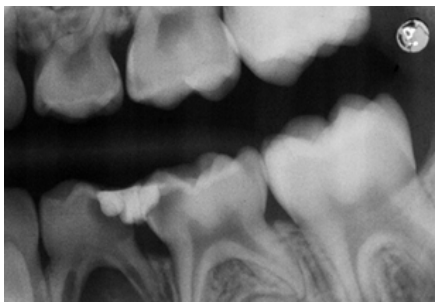
Advantages

- Cleans the surface effectively
- Contributes to ensuring optimal chemical adhesion
- Creates micro-mechanical retention
- Reduces the risk of post operative sensitivity
- Enhances the marginal seal
- Has a blue tint to help with application control
- 10 sec application, followed by rinsing and gentle drying

20%
10 seconds

Male - age 20


Fuji 7 EP
White
Fuji 9 Extra A3




GC Fuji VII CAPSULE
50 CAPSULES
7
White


Dr J Lucas

Male - age 80

Fuji 7 EP Pink

3 months

6 months

Disease Control and Stabilisation

Caries removal with slow speed burs and hand instruments
Restore with high fluoride releasing GIC
Colour match of restorative not required
Highlights areas to be cleaned

MINIMALLY INVASIVE DENTISTRY

SILVER MODIFIED ATRAUMATIC RESTORATIVE TECHNIQUE (SMART): AN ALTERNATIVE CARIES PREVENTION TOOL

Alvear FAB, Jew JA, Wong A, Young D. Stoma Edu J. 2016; 3(2):18-24

Silver Modified Atraumatic Restorative Technique (SMART) is when Silver Fluoride is applied and immediately restored or sealed with conventional GIC.

Placement of Silver Fluoride and GIC at the same appointment is especially useful when, for whatever reason, the patient will not be able to return for subsequent dental treatment and it is deemed advantageous to use a minimally invasive procedure rather than nothing at all.

https://www.creightonsilverfluoride.com/

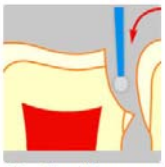
About CSDS: Caries Status Disclosing Solution

CSDS as the name implies was designed to provide a reliable and quick visual guide to the status of active carious lesions in primary molars. It simplifies diagnosis and reduces the need for other diagnostic aids such as probing the surface of the lesion and taking radiographs.

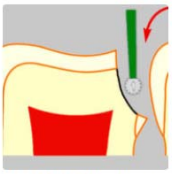
In the technique, silver fluoride is applied to the active lesion and subsequently followed up by an application of stannous fluoride. This turns the lesion black. This is deliberate. If the black surface remains it is a sign that the lesion is not progressing. If this colour is lost and the lesion turns a brown/yellow it is indicative of underlying lesion progression.

The silver fluoride/stannous fluoride combination is now also finding a valuable placed in aged dental care.

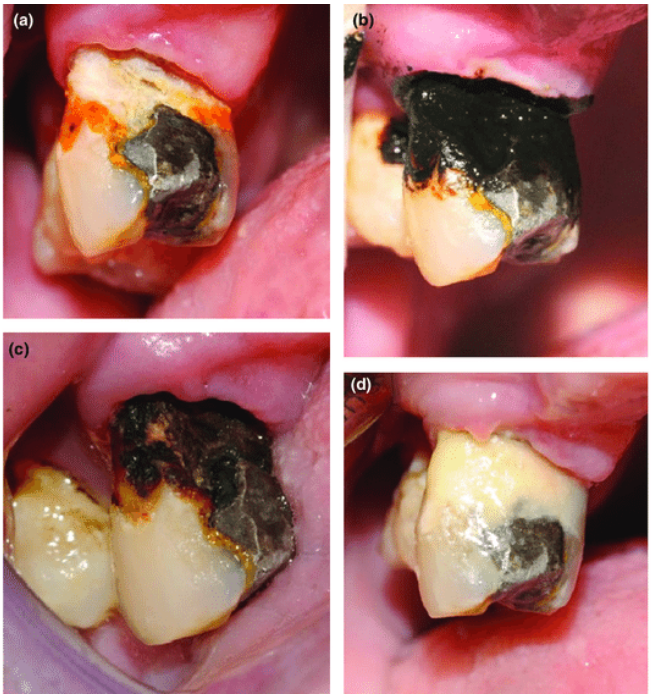
Example of the 'Black Diamond'.
Left: Carious lesion before application of CSDS.
Right: Appearance after placement of CSDS. As long as the blackness remains it is indicative of the lesion being arrested.

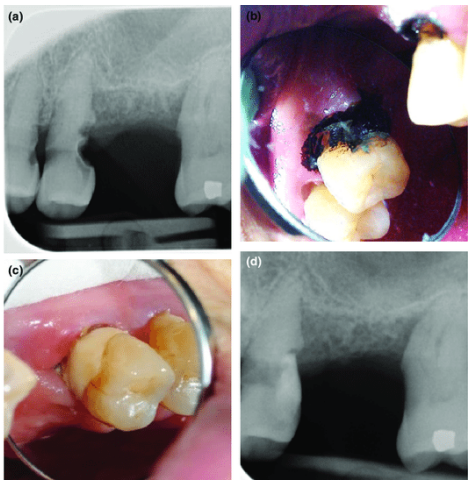


CSDS silver fluoride preparation is applied with a microbrush and the site is kept wet with the solution for at least 1 minute(ideally 3 minutes)



After the tooth has been kept wet with the silver fluoride preparation for time required ; CSDS 10% stannous fluoride is applied as a reducing agent to turn the surface of the carious lesion black.





Silver fluoride techniques for use in aged-care dentistry.
Deutsch A. Dental Outlook, 2014:1-23.

Arresting rampant dental caries with silver diammine fluoride.

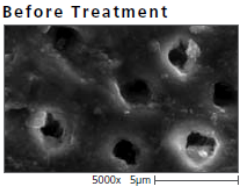
Chu CH, Lee AH, Zheng L, Mei ML, Chan GC. BMC Research Notes 7(1):3 · January 2014

Diammine Silver Fluoride

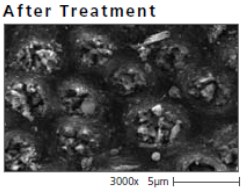
Easy and quick to apply

The Riva Star capsule system is color-coded and easy to use. No bottle dispensing is required, thus minimising spillage when accidentally dropped on the bench.

Before Treatment



After Treatment



Insoluble silver iodide precipitates blocking dentinal tubules.

0.05ml capsules of Riva Star

Step 1 (Silver Capsule) contains:
Silver Fluoride 30 – 38%
Ammonia solution > 60%
(0.06g / mL fluoride ions)

High PH - Potential for tissue burn

Step 2 (Green Capsule) contains:
Potassium Iodide solution
Produces white precipitate - minimises the risk of staining

90 years old

A tooth has decoronated because of caries, should I remove it?

Caution is warranted when teeth are decoronated, severely damaged or anatomically at risk of a surgical extraction being necessary as surgical intervention should be avoided if possible.

If asymptomatic, you may be able to temporarily avoid treatment or simply cover with an interim restoration. Non-invasive techniques such as the use of silver diamine fluoride are appropriate if you determine that this will help to reduce the chances of escalation of the condition.

Male - age 92

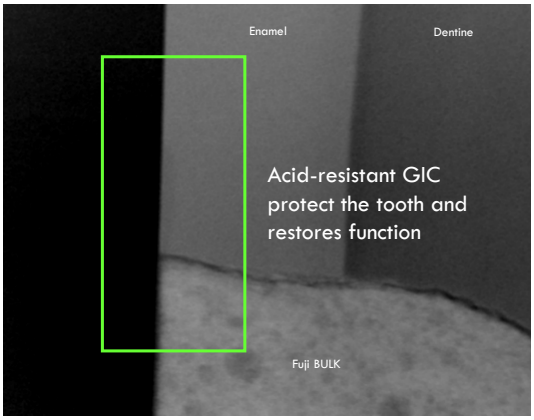
Fuji Bulk

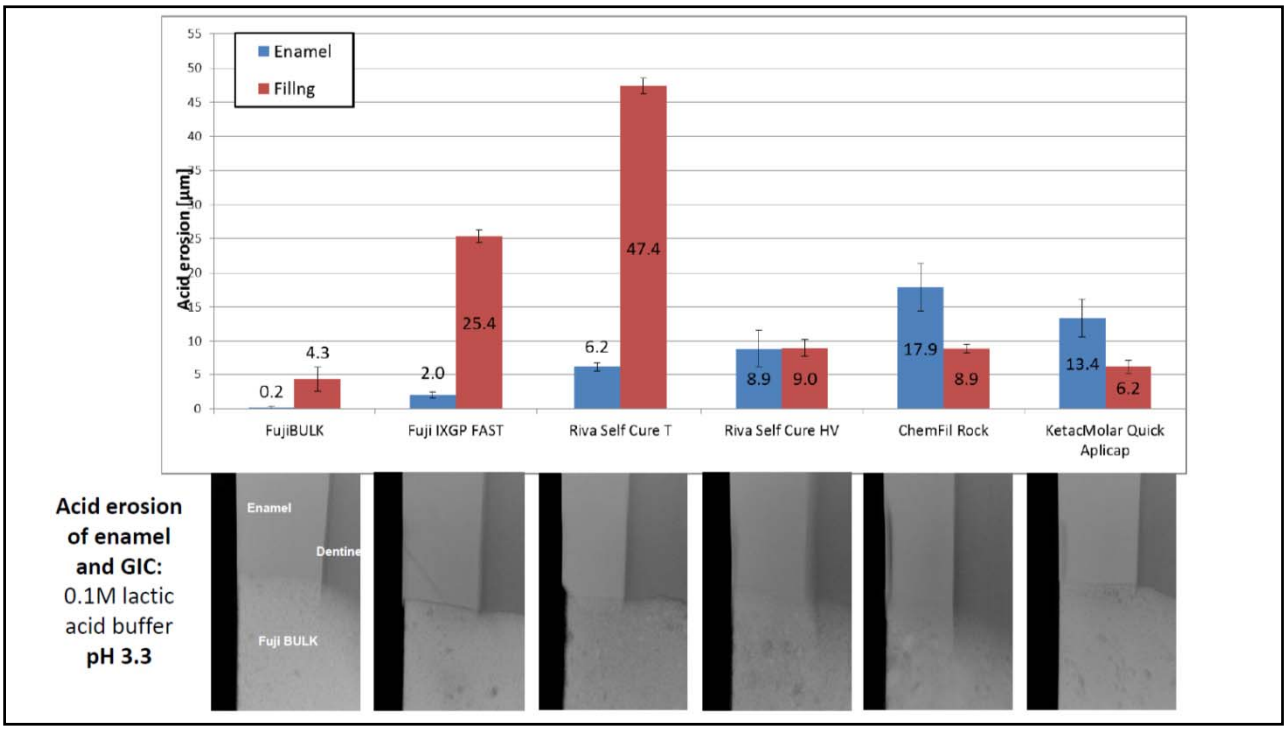
Fuji BULK strengthens and protects surrounding tooth structures

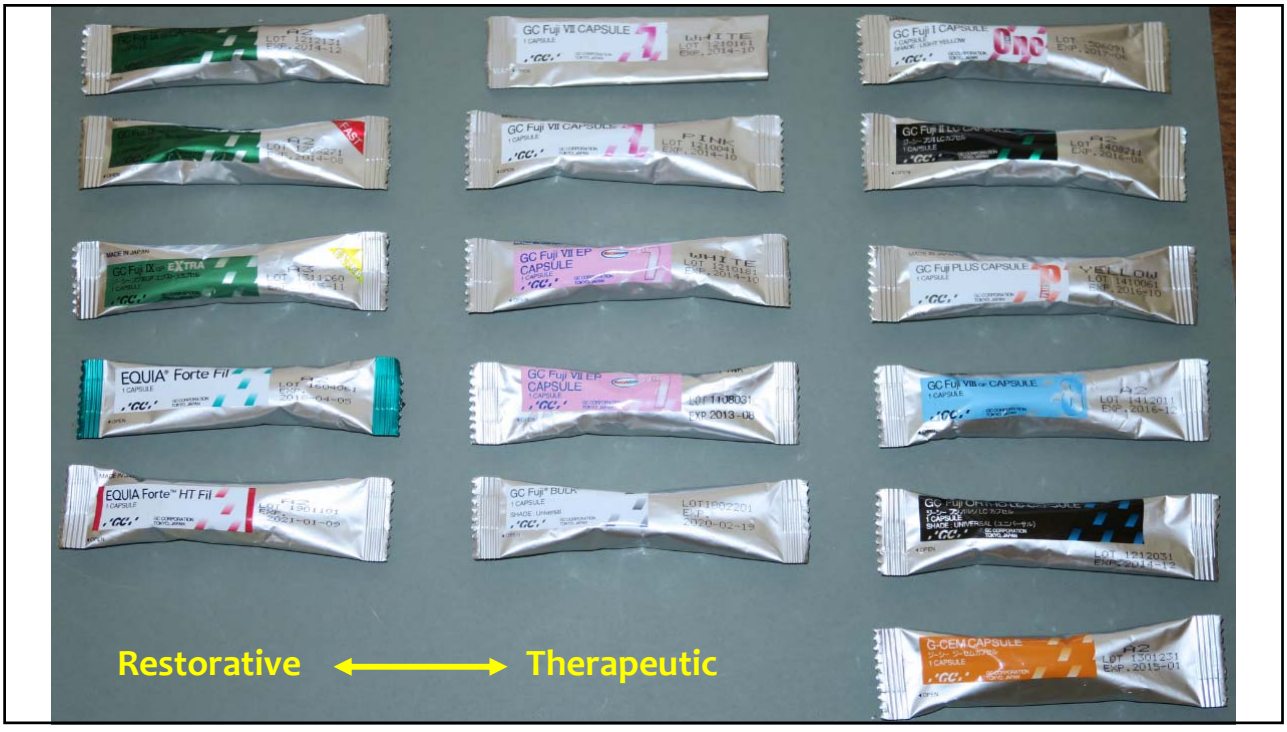
Fuji BULK was designed with hostile oral environments in mind, recognising the growing need for a bulk-cure, self-adhesive restorative that could **provide a balance between restoring function and protecting surrounding and adjacent tooth surfaces**.

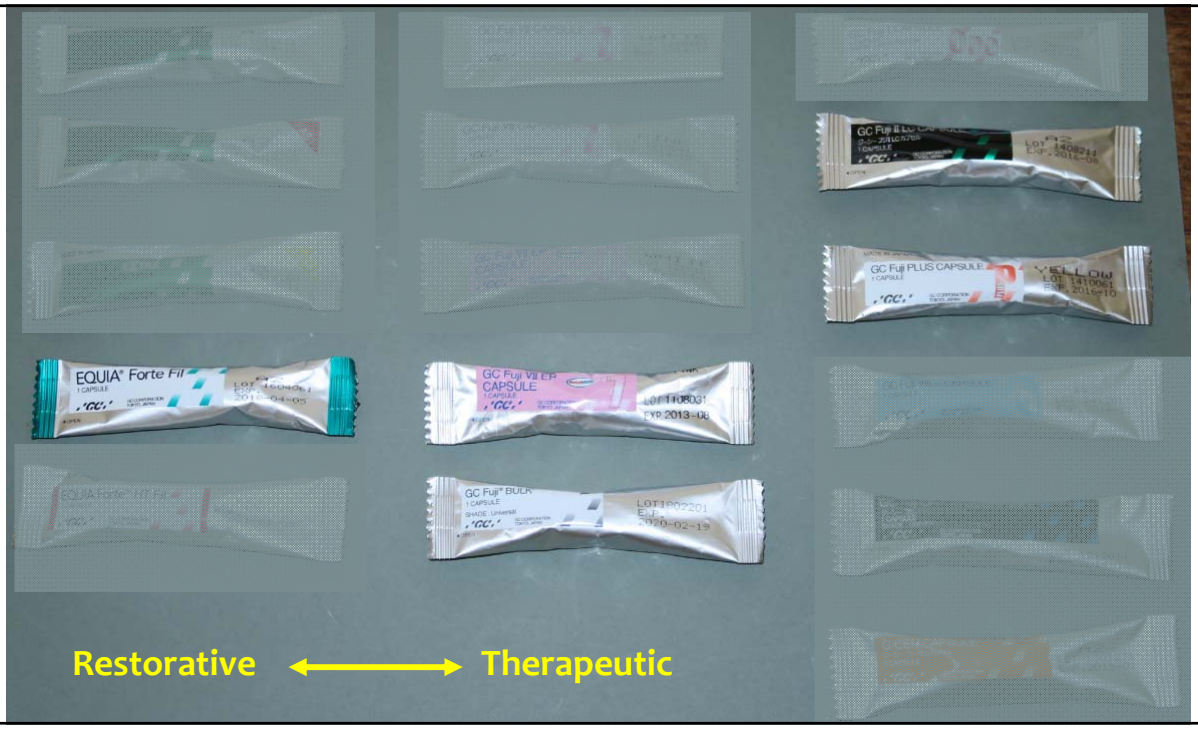
Fuji BULK could be your first choice as a base in the sandwich technique, is perfectly suited to geriatric and paediatric restorations, and its speed of set makes it ideal for emergency, transitional or stabilisation procedures.

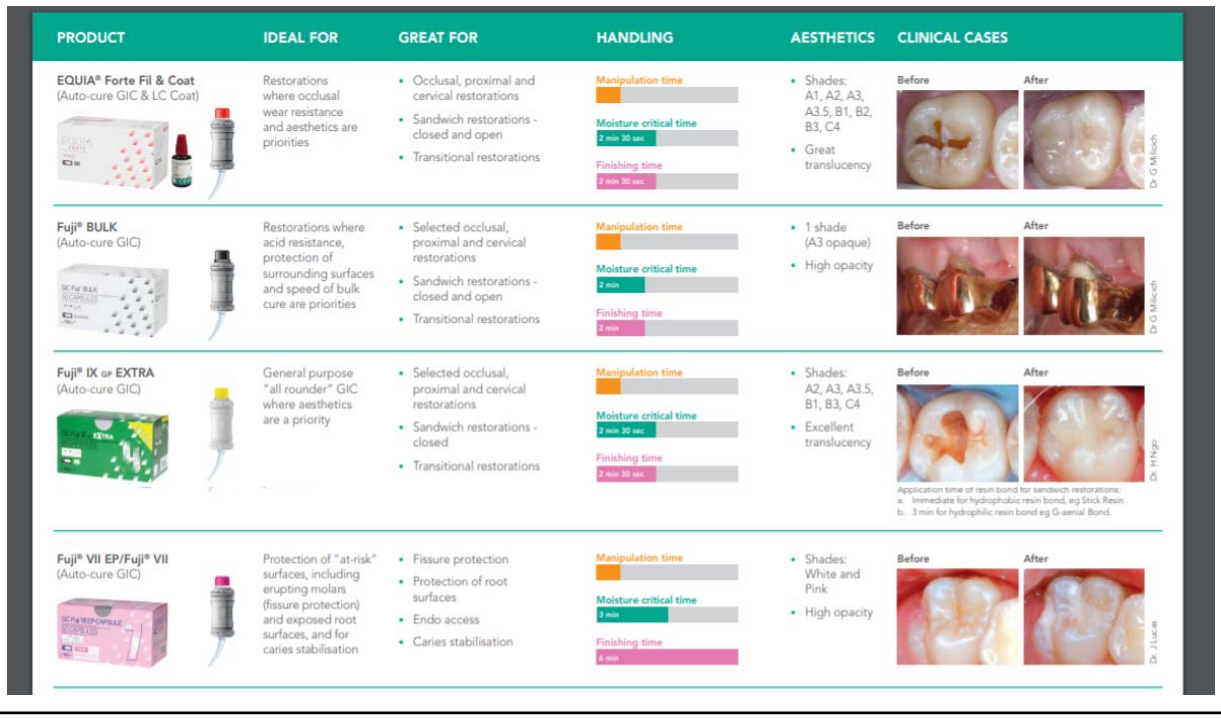
pH 4.0 lactic acid challenge*




Enamel
Filling
Acid erosion [µm]
55
50
45
40
35
30
25
20
15
10
5
0
0.2
4.3
2.0
25.4
6.2
47.4
8.9
9.0
17.9
8.9
13.4
6.2
FujiBULK
Fuji IXGP FAST
Riva Self Cure T
Riva Self Cure HV
ChemFil Rock
KetacMolar Quick Aplicap
Acid erosion of enamel and GIC: 0.1M lactic acid buffer pH 3.3
Enamel
Dentine
Fuji BULK


Restorative
Therapeutic





PRODUCT	IDEAL FOR	GREAT FOR	HANDLING	AESTHETICS	CLINICAL CASES
EQUIA® Forte Fil & Coat (Auto-cure GIC & LC Coat)	Restorations where occlusal wear resistance and aesthetics are priorities	• Occlusal, proximal and cervical restorations • Sandwich restorations - closed and open • Transitional restorations	Manipulation time Moisture critical time 2 min 30 sec Finishing time 2 min 30 sec	• Shades: A1, A2, A3, A3.5, B1, B2, B3, C4 • Great translucency	Before / After Dr G Micoch
Fuji® BULK (Auto-cure GIC)	Restorations where acid resistance, protection of surrounding surfaces and speed of bulk cure are priorities	• Selected occlusal, proximal and cervical restorations • Sandwich restorations - closed and open • Transitional restorations	Manipulation time Moisture critical time 2 min Finishing time 2 min	• 1 shade (A3 opaque) • High opacity	Before / After Dr G Micoch
Fuji® IX GP EXTRA (Auto-cure GIC)	General purpose "all rounder" GIC where aesthetics are a priority	• Selected occlusal, proximal and cervical restorations • Sandwich restorations - closed • Transitional restorations	Manipulation time Moisture critical time 2 min 30 sec Finishing time 2 min 30 sec	• Shades: A2, A3, A3.5, B1, B3, C4 • Excellent translucency	Before / After Application time of resin bond for sandwich restorations: a. Immediate for hydrophobic resin bond, eg Stick Resin b. 3 min for hydrophilic resin bond eg G-aenial Bond. Dr H Ngo
Fuji® VII EP/Fuji® VII (Auto-cure GIC)	Protection of "at-risk" surfaces, including erupting molars (fissure protection) and exposed root surfaces, and for caries stabilisation	• Fissure protection • Protection of root surfaces • Endo access • Caries stabilisation	Manipulation time Moisture critical time 3 min Finishing time 6 min	• Shades: White and Pink • High opacity	Before / After Dr J Lucas

	Fluoride Release	Solubility	Aesthetics	Compressive Strength	Fracture Toughness	Moisture Critical Time	Radiopacity
Highest	Fuji 7	Fuji 7	Fuji 2 LC	Equia Forte Fil	Fuji 8	Fuji 8	Fuji Bulk
	Fuji 7 EP	Fuji 7 EP	Fuji 8	Fuji Bulk	Fuji 2 LC	Fuji 7	Fuji 8
	Equia Forte Fil	Fuji IX Extra	Fuji IX Extra	Fuji IX Extra	Fuji Bulk	Fuji 7 EP	Fuji 2 LC
	Fuji IX Extra	Equia Forte Fil	Equia Forte Fil	Fuji 8	Equia Forte Fil	Fuji IX Extra	Fuji 7
	Fuji 8	Fuji Bulk ★	Fuji Bulk	Fuji 2 LC	Fuji IX Extra	Equia Forte Fil	Fuji 7 EP
	Fuji 2 LC	Fuji 2 LC ★	Fuji 7 EP	Fuji 7	Fuji 7	Fuji Bulk	Fuji IX Extra
Lowest	Fuji Bulk	Fuji 8 ★	Fuji 7	Fuji 7 EP	Fuji 7 EP	Fuji 2 LC	Equia Forte Fil

★ Test methods differ

Management of the fractured / lost restoration Potential pain / soft tissue ulceration

Use of appropriate temporisation materials and techniques

- Radiographs, isolation, and local anaesthetic agents as required
- Minimally invasive preparation
- Use high strength glass-ionomer cement for interim / long term restoration
- Use of silver amalgam may be an option
- Use of composite resin may not be recommended unless clinician is able to etch tooth and remove etchant without creating aerosol.
- Minimal trimming and polishing required with GIC

Female - age 60

Fuji IX Extra

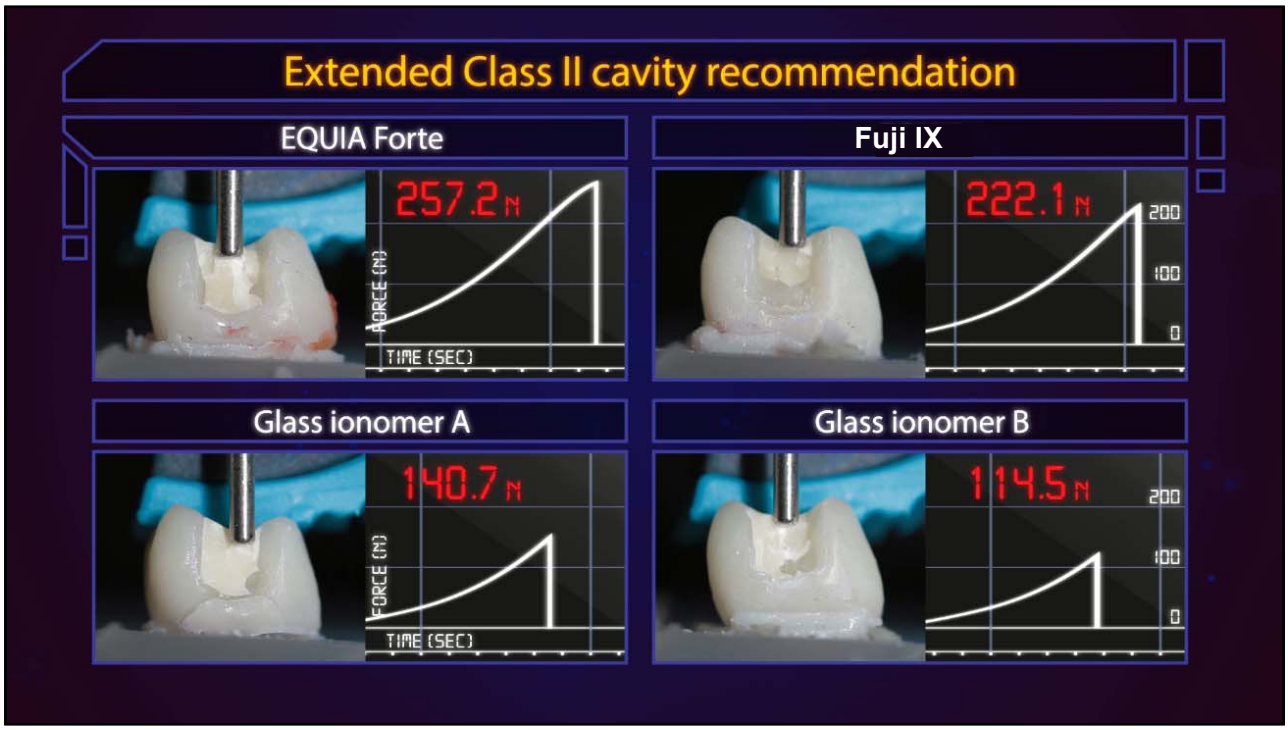
Equia Forte Fil


GC Fuji IX GP EXTRA
1 CAPSULE
EXTRA


EQUIA® Forte Fil
1 CAPSULE


EQUIA® Forte
Coat
4mL


Cavities fillled as per manufacturer's instructions



Occlusal Force Guage

Maximum voluntary molar bite force in subjects with normal occlusion
European Journal of Orthodontics, Volume 33, Issue 4, August 2011, Pages 427–433

Maximum occlusal bite force in pre-school children with different occlusal patterns.

Abu-Alhaija E, Owais AI, Obaid H. J Clin Exp Dent. 2018 1;10(11):e1063-e1068.

The means of MOBF for the different occlusal relationship ranged from 179.20N to 245.11N

Maximum occusal bite force for children in different dentition stages.

Owais AI, Shaweesh M, Abu Alhaija ES. Eur J Orthod. 2013;35(4):427-33.

176 N in early primary stage, 240 N in late primary stage, 289 N in early mixed stage
433 N in late mixed stage, 527 N in the permanent dentition stage

Occlusal force and its distribution in the position of maximum intercuspation in individual normal occlusion: a cross-sectional study.

Ye Y, Di P, Jia S, Lin Y. Zhonghua Kou Qiang Yi Xue Za Zhi. 2015 Sep;50(9):536-9.

The maximum occlusal force in the position of maximum intercuspation was (900 ± 361) N

- The mean value of occlusal force on the molars ranged from 107 to 156 N
- The mean value of occlusal force ranged from 39 to 66 N on the premolars
- The mean value of occlusal force ranged from 11 to 33 N on the front teeth.

Effect of age on bite force

Mei Xin Chong et al, Journal of Oral Science, 2016 58:3; 361-363

- Although mean bite force in adults over 60 was lower (420.5 ± 242.0 N) than the young adults (541.4 ± 296.3 N), the difference was not significant.
- These findings suggest that bite force is unaffected by age in adults with adequate dentition.

Comparison of maximum bite force and dentate status between healthy and frail elderly persons

Miura H et al, Journal of Oral Rehabilitation 2001 28; 592-595

- Median of maximum bite force in healthy males was 408.0 N, and that of the healthy females was 243.5 N.
- Median of maximum bite force in frail males was 196.0 N, and that of the frail females was 130.5 N.
- These results suggest that the frail elderly have significantly reduced bite force.

The compressive strength of composite resins (250–350 MPa) is close to enamel and dentine.

Fracture resistance of restored maxillary premolars. Petronijević B, et al. Contemporary Materials, III:2 (2012)

The compressive strength of enamel (384 MPa) and dentine (297 MPa) and the fracture strength of a natural tooth (molar = 305 MPa; premolar = 248 MPa) offer excellent mechanical standards to select the optimal strength for restorative materials.

Composite resins in the 21st century. Willems G, Lambrechts P, Braem M, Vanherle G. Quintessence Int. 1993 Sep;24(9):641-58.

Surface Coatings

G-COAT PLUS

Nanofilled Self-Adhesive Light-Cured Protective Coating

G-Coat PLUS is a light-cured protective clear coating formulated with adhesive monomer and nanofillers for conventional GIC, resin-reinforced GIC and resin materials.

Characteristics & Benefits

- Provides an immediate clear, glossy surface to composite resin restorations, glass ionomers and provisionals
- Functional monomer provides adequate bonding to both resin-based materials and glass ionomers
- Uniformly disperses nano-fillers increasing resistance to wear, staining or discolouration
- Protects glass ionomer restorations against water contamination during initial cure

Finishing
and polishing

Finished restoration

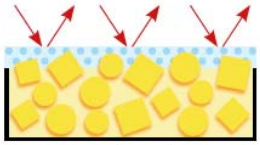
Final polishing

Surface roughening and loss of gloss over time

G-Coat PLUS

Finished restoration

Coating with G-Coat PLUS which contains uniformly-dispersed nano fillers



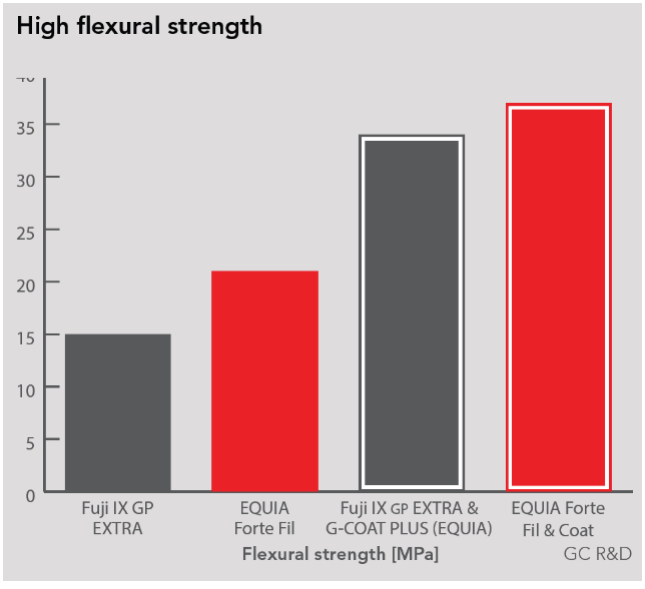
Coating provides a dispersion hardened surface for superior wear resistance and gloss retention

EQUIA proves its outstanding performance in class I cavities in clinical trials

Survival rates for EQUIA class I restorations	
2 years – 100%	Friedl et al 2011
3 years – 100%	Diem et al 2014
5 years – 100%	Gurgan et al 2014
2 years – 99%	Klinke 2013
4 years – 98.70%	Basso 2014

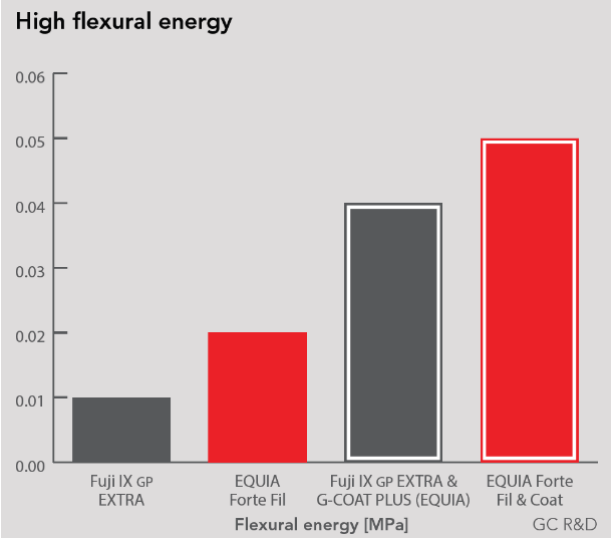
Improved Flexural Strength

EQUIA Forte Fil has a 22 - 39% increase in flexural strength.



Significant Increase In Fracture Toughness

Energy required to fracture equates to Durability

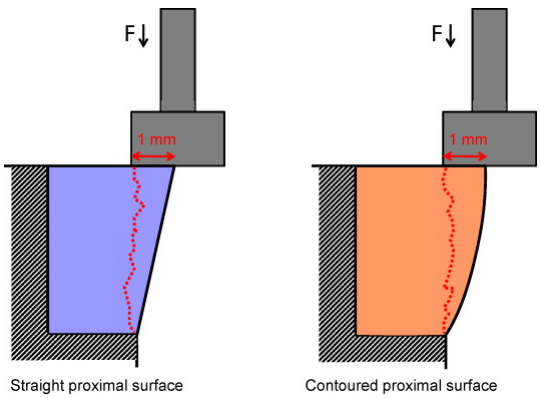


The effect of proximal contour on marginal ridge fracture of Class II composite resin restorations

B.A.C.Loomans, F.J.M.Roeters, N.J.M.Opdam, R.H.Kuijs

Journal of Dentistry 2008, 36:10,828-832

Contoured proximal surfaces resulted in **significantly stronger marginal ridges** (365.5 ± 87.6 N) compared to straight surfaces (290.5 ± 64.2 N) ($p < 0.001$).



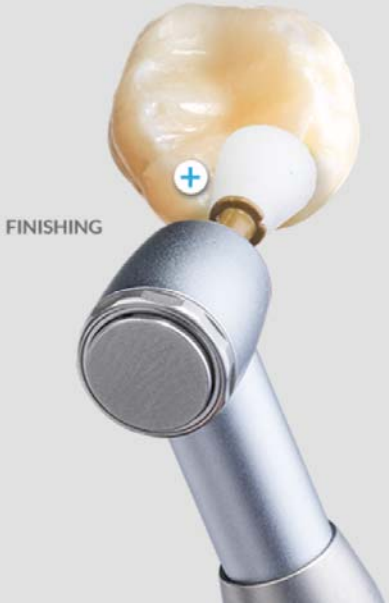
Conventional GIC

RRGIC / RMGIC

Restoration Finishing and Polishing

On average, **finishing and polishing** represents **14%** of **total chair time** for a Class II procedure.[18]

18 DENTSPLY Caulk Procedure Timing Breakdown Study. Data on file.



Restoration Finishing and Polishing

Evaluation of Surface Roughness, Hardness, and Gloss of Composites After Three Different Finishing and Polishing Techniques: An In Vitro Study.

Nithya K, Sridevi K, Keerthi V, Ravishankar P. Cureus. 2020 19;12(2)

Effect of four different finishing and polishing systems on resin composites: roughness surface and gloss retention evaluations.

Tosco V, Monterubbianesi R, Orilisi G, Procaccini M, Grandini S, Putignano A, Orsini G. Minerva Stomatol. 2019 Oct 15.

A randomised controlled study on the use of finishing and polishing systems on different resin composites using 3D contact optical profilometry and scanning electron microscopy.

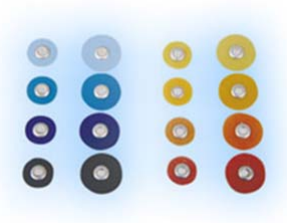
Daud A, Gray G, Lynch CD, Wilson NHF, Blum IR. J Dent. 2018 Apr;71:25-30.

Evaluation of the surface hardness, roughness, gloss and colour of composites after different finishing/polishing treatments and thermocycling using a multitechnique approach.

Pala K, Tekçe N, Tuncer S, Serim ME, Demirci M. Dent Mater J. 2016;35(2):278-89.

Recommended Finishing Procedure

- STEP 1: - Gross Reduction
  - Fine Diamond or 12-Fluted carbide burs:
  - Gross anatomy.
  - Marginal ridge, interproximal embrasure
  - Refine anatomical shape.
  - Care with adjacent teeth and gingiva.
  - Sof-lex discs: facial and interproximal areas.



Recommended Finishing Procedure

- STEP 2: - Finishing (pre-polishing)
  - Intermediate finishing:
  - Impregnated silicone or rubber abrasives.
  - Enhance finishers: minimally abrasive to adjacent enamel.
  - Aluminum-oxide bonded abrasives: used dry with light to moderate pressure and air to clear the field and dissipate heat buildup.

Recommended Finishing Procedure

- STEP 3: - Polishing
  - aluminum oxide or diamond containing composite polishing paste
  - Diapolisher Diamond Polishing Paste (GC)
  - Prisma-gloss (Dentsply/Caulk) or Enamelize (Cosmedent).
  - Proximal Areas: disc-shaped felt devices.
  - Super Snap Buff Disc (Shofu) or Flexibuff (Cosmedent)

Restoration Polishing and Maintenance

Effect of hygiene maintenance procedures on surface roughness of composite restoratives.

Yap AU, Wu SS, Chelvan S, Tan ES. Oper Dent. 2005;30(1):99-104.

For all materials, the use of pumice-water slurry with brush also caused significant roughening.

Composite restorations may require re-polishing after exposure to some hygiene maintenance procedures.

Do nanofill or submicron composites show improved smoothness and gloss? A systematic review of in vitro studies.

Kaizer MR, de Oliveira-Ogliari A, Cenci MS, Opdam NJ, Moraes RR. Dent Mater. 2014;30(4): 41-78.

There is no evidence to support the choice of nanofill or submicron composites over traditional microhybrids based on better surface smoothness and/or gloss, or based upon maintenance of those superficial characteristics after surface challenges.

RESEARCH ARTICLE Open Access

Effect of air-polishing on surface roughness of composite dental restorative material – comparison of three different air-polishing powders

Janiszewska-Olszowska J, Drozdzik A, Tandecka K and Grocholewicz K *BMC Oral Health. 2020 Jan 30;20(1):30*

Microhybrid light-cure composite resin samples were airpolished with sodium bicarbonate (40 µm), glycine (25 µm) and erythritol (14 µm)

- Sodium bicarbonate had a stronger detrimental effect on composite surface than glycine or erythritol.
- The small particle size of erythritol, along with its low hardness (2 on the Mohs hardness scale) will produce less roughness.

Restoration Polishing and Maintenance

- The surface texture of composites has an influence on plaque accumulation, discoloration and wear.
- Decreased bacterial adhesion is observed when surface roughness is less than 0.15 µm.
- The tip of the tongue is able to detect a surface roughness change of 0.3 µm, thus a smooth surface adds to the patient's comfort.
- The final surface polish influences the aesthetics of composite restorations and contributes to the gloss as well as a better colour stability.

Summary and Conclusions

ART and adapted ART provide treatment options that are;

- Minimally invasive
- Low risk
- Non-threatening
- Mainly painless
- Aerosol free / Aerosol reduced
- Efficient and effective
- Economical

- The use of ART will enhance the armamentarium of the dentist in providing appropriate and effective treatment both now and in the future
- A range of adhesive materials can be used with an ART approach
- Excellent restoration longevity can be achieved with good technique

Questions
???