The use of GIC in special care: state of the art

Prof. Luc A.M. MARKS DDS, MSc, Phd
Center of Special Care in Dentistry
Ghent University - Belgium
glassionomers and special care ?
Pubmed : 3 hits
glassionomers and special needs
glassionomers and special needs ?

Pubmed : 3 hits
The use of glassionomer in special needs patients

Gryst and Mount
Australian dental J 1999
## Glass ionomer – Resin Composite continuum

<table>
<thead>
<tr>
<th>GIC</th>
<th>RM-GIC</th>
<th>PAM -C</th>
<th>RC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ketac Fil</td>
<td>Vitrebond</td>
<td>Dyract</td>
<td>P50</td>
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<tr>
<td>Ketac Bond</td>
<td>Vitremer</td>
<td>Dyract AP</td>
<td>Z250</td>
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<td>Ketac Silver</td>
<td>Photac Fil</td>
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<td>Ketac Molar (Q)</td>
<td>Photac Bond</td>
<td>Hytac</td>
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<td>Fuji II</td>
<td>Fuji II LC</td>
<td>F 2000</td>
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<td>Fuji IX</td>
<td>GC Lining LC</td>
<td>Twicky star</td>
<td>Tetric</td>
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<td>GC Baseline</td>
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<td>I…..</td>
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<tr>
<td>Chemfil</td>
<td>Chemflex</td>
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</table>
GIC

advantages
prevention against recurrent caries

disadvantages
mechanical properties
(Beyls et al. 1993, Van Dijken et al. 1993, de Gee et al. 1996)
CONVENTIONAL GIC
Type I restorations:

Long term Failure of Type I restorations seems to be rather low and the different materials exiting on the market seem to give comparable results.
Type I minimal preparation
low occlusal load → mechanical properties
less important

Adhesive materials as resin composite, compomers or glass ionomercements seem to be the materials of choice.
Type V restoration.

Mechanical properties as strength and wear are not that important in this type of restoration – isolation can be a problem!

So GIC can be preferred.
Type II restorations
1972 - 2012

- GLASS IONOMERS (GIC)
- REINFORCED GIC (R-GIC)
- POSTERIOR COMPOSITES
- RESIN-MODIFIED GIC (RM)
- POLY-ACID MODIFIED COMP. (PAM-C)
- HIGHLY VISCOUS GIC (HV-GIC)
Fluoride Release

By courtesy of Prof. Verbeeck
Marks et al. 2000
Fluoride Release

Marks et al. 2000
RESTORATIVE DENTISTRY WITH POLYMERS

**MECHANICAL PROPERTIES**
- **TENSILE STRENGTH**
  - COMP > PAM-C > RM-GIC > GIC
  - Uno et al. Dent Mater 1998

**MECHANICAL PROPERTIES**
- **WEAR**
  - RM-GIC > GIC ≈ PAM-C > COMP

**CHEMICAL PROPERTIES**
- **FLUORIDE RELEASE**
  - GIC > RM-GIC > PAM-C > COMP
  - Verbeeck et al. Biomaterials 1998
  - Marks et al. Biomaterials 2000
Ketac Fil (3y)

FLUORIDE RELEASE ???
CONVENTIONAL GIC
REINFORCED GIC
HIGHLY VISCOUS GIC
A Difficult Choice

Adhesion
Mech. Properties

Oral environment

Een moeilijke keuze

L'embarras du choix
major failures of restorations:

- Mechanical failure (microdentistry)
- Recurrent caries

(Kilpatrick 1993)
Microdentistry

P. Surmont, L. Martens, R. D’Hauwers

A decision tree for the treatment of caries in posterior teeth

Quint Int., 21:239-246, 1990
CARIES !!
Changing caries pattern

Marthaler et al. 1996, Poulsen et al. 1999

Western world: 80% caries is found in 20% of the people
(Twetman et al. 2000)
oral environment

????
oral environment

Low pH

- regurgitation
- saliva flow
- soft drinks
- irradiation
  - ....
Low pH oral environment

- regurgitation
- saliva flow
- soft drinks
- radiation
- ....
- saliva flow
- trauma of salivary glands
- use of medication

(Ferguson, Arch Oral Biol., 1999)
Low pH oral environment

- regurgitation
- saliva flow
- soft drinks
- irradiation
- soft drinks
young adults
softdrinks
sportsdrinks
breezers
erosions !!!
pH attacks !!!
The influence of soft drinks on the Fluoride release of Glasionomer cements and Polyacid modified composites

L.A.M. Marks *, C.W. Vercruysse°, R.M.H. Verbeeck°
Ghent University - Belgium

Introduction:

Glasionomer (GIC) – fluoride release

Polyacid modified composite (PAM-C)
Compomer – fluoride release

Fluoride release GIC >> PAM-C

Verbeeck et al. Biomaterials 1998
Introduction:

Fluoride release influenced → different environments

i.e.
- Acid (low pH)
- complex

Verbeeck, De Maeyer, Marks et al. - Biomaterials 1998, 509-519
Aim:

Can soft drinks influence the fluoride release of standard restorative materials as GIC and PAM-C?
Material and Methods: 2 materials

Glasionomer: Ketac Fil ® (3M - Espe)

PAM-C: Dyract ® (Dentsply - de Trey)

Monsters: cylindrical specimens 6 mm diam / 3 mm thick
Material and Methods: 2 softdrinks

- Coca cola® (regular)

- Minute Maid® (orange juice)

- 2 x distilled H₂O (control)
Results

GIC - Ketac Fil
µg F/cm²

Ketac Fil

_days_

KF water
KF cola
KF cola (2 h)

0,00 10,00 20,00 30,00 40,00 50,00 60,00 70,00

fluoride

1 2 3 4 5 6 7 8 9 10 11 12 13 21 28
Conclusions:

- Ketac Fil: 24 h H₂O versus cola/orange juice (p < 0.05)

H₂O versus cola (p < 0.05)
H₂O versus orange juice (p < 0.05)
Cola versus orange juice (p < 0.05)
Conclusions:

Fluoride release is influenced by contact with soft drink!

Ketac Fil: 24 h
Clinical impact:

→ the choice of material!

Soft drink users could benefit from the use of GIC by the increased fluoride release.

Supported by the scientific grant of the Flemish dental association VVT – laureate 2003
Low pH oral environment

- regurgitation
- saliva flow
- soft drinks
- irradiation
irradiation head / neck region

- almost no production of saliva

- pH ↓↓↓
Two year clinical performance of GIC and resin composite restorations in Xerostomic head and neck irradiated cancer patients

De Moor et al 2011
Clinical Oral Investig., 15:31-38
The proper material for each individual oral environment

pH low

fluoride release of

Conventional GIC

De Moor et al. 1996

RM - GIC

Verbeeck et al. 1998
Every time the pH ↓↓↓

Fluoride release ↑↑

On demand
Low pH environment
Resting plaque
Neutral pH
Complex formation
Cumulative fluoride release in citrate pH 7

- Marks et al., Biomaterials, 2000
Resting plaque (neutral pH)

Fluoride release of GIC ↑
Fluoride release of RM–GIC ↑↑
Fluoride release of PAM-C ↑↑↑

Verbeeck et al., Biomaterials, 1998
Marks et al., Biomaterials, 2000
Resting plaque

Fluoride release ↑ ↑

On demand
Materials increase pH of the environment!!

- **In vitro pH lactic acid**: 4.5
  
  *(active caries pH 4.9 arrested caries pH 5.7)*
  

- **after 10 minutes**
  
  Ketac Molar: 5.3
  Fuji IX: 5.6
  Vitremer: 5.9

Restorative materials and fluoride from the environment

Pumpfunction / Storage-function for Fluoride
GIC, RM-GIC

The proper “SMART” material for each patient

- Adhesie materials
- Microdentistry
- Oral hygiene
- Oral habits
Although prevention still remains fundamental in oral hygiene. Do we really think that we can change the habits of person addicted to softdrinks or an anorexia patient or ?????

Can it be a suggestion to add this fact into our choice of restorative material.
High Caries risk patients
Special Care patients

Prev >> mech.
Properties

ART ???!
ART ???!

The ART approach using Glassionomers in relation to global health care

Frencken –Dental Materials 2010: 26 1-6
Finishing – polishing?

High speed and water cooling

N. Koupis, L. Marks et al.
Sealing with GIC ???
Sealing with GIC ???

FUJI VII / FUJI TRIAGE

Brisbane 2000
GIC + extra's
FUJI VII – EP ( CCP-ACP)

Reynolds 2012 - Melbourne - Australia

In Vitro!
In Vivo?
Selection of a material
Selection of a restorative material

- Microdentistry + Chemical properties !!!

- pH low GIC / RM-GIC

- Neutral pH resting plaque RM-GIC

- Buffer capacity / Fluoride pump and storage

- SMART DENTIST
Selection of a material

- Patient ..... → allergy ?? / cooperative ??
- Caries risk .... → risk group ??
- Oral environment / → frequency of meals / diet / oral hygiene
- Oral habits .......
- Type of cavity ....... → GV Black, Microdentistry
- Material properties ..... → Mechanical / Chemical
MANAGING CARIES IN
A PREVENTIVE PERSPECTIVE

* INDIVIDUAL CARIES RISK ASSESSMENT

* MICRODENTISTRY.....within
a CAVITY PREPARATION CONTINUUM,
with ADHESIVE ( smart… ) MATERIALS
within a MATERIALS CONTINUUM

* ADJUSTED PREVENTIVE STRATEGIES
DENTAL MATERIALS CONTINUUM

GIC → RM-GIC → PA-COMP → COMP

100%

FLUORIDE

VINYL
MICRO-MECHANIC. ADHESION (bonding)

CARBOXYLATE
CHEMICAL ADHESION

CLINICAL RESULTS

0%

100%

GIC → RM-GIC → PA-COMP → COMP
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luc.marks@UGent.be