Protemp™ 4

Temporisation Material

Technical Data Sheet

3M ESPE

1 3M ESPE – The innovation leader in temporisation

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Temporary restorations are an indispensable part of the complete crown and bridge restorative procedure, and the roles which a temporary restoration must fulfil have become more demanding over time. In the past, the functional aspects of temporary restoration predominated. However, with recent advancements in restorative dentistry, there is an ever increasing demand placed on aesthetics as well as structural strength.

3M™ ESPE™, with more than 40 years of experience in temporisation, meets this demand with the introduction of Protemp™ 4 Temporisation Material. This unique bis-acrylic composite material with a new generation of sophisticated fillers – a result of advances by 3M ESPE in fillertechnology – sets new industry standards with the following key features:

- Record breaking **fracture resistance and toughness.**
- **Highly aesthetic** through natural gloss and fluorescence.
- **Easy handling and fast procedure.** No polishing or glazing.

Protemp 4 temporisation material joins a family of high quality, reliable temporisation materials designed to meet the evolving needs of the dental professional.

Indications

- Crowns
- Bridges
- Inlays and onlays
- Long-term temporaries
- Veneers
- Implant abutments

2 Protemp™ 4 Temporisation Material: unique in the market with a string of unparalleled features

Protemp™ 4 Temporisation Material is the latest development from 3M ESPE of bis-acrylic composite material for multiple-unit restorations in the 10:1 Garant™ Cartridge.
In vitro tests show that Protemp 4 material ranks highest in important mechanical characteristics such as:

- **Fracture toughness** and
- **Compressive strength**

Results from mastication testing which comes closest to the *in vivo* situation corroborate these findings.

The high mechanical performance profile of Protemp 4 temporisation material translates not only into enhanced clinical safety, but also into more convenience for patients and dentists.

Additionally, Protemp 4 temporisation material with its top-of-the-class fracture resistance and remarkable aesthetics is well equipped to be the first choice for the most demanding discipline in temporisation, i. e. as a long-term temporary.

3 Product benefits at a glance

Record-breaking toughness

- Highest fracture resistance
- Better abrasion stability through new sophisticated filler technology
- Also indicated for long-term temporisation

Outstanding aesthetics

- Brilliant, natural gloss without polishing
- 6 fluorescent shades (Bleach, A1, A2, A3, A3.5, B3) matched with Filtek™ Supreme XTE Flowable Restorative
- Excellent colour stability, virtually no colour change

Easy and fast handling

- Tangibly less inhibition layer than other bis-acrylic materials
- Gloss without polishing – just cleaning with ethanol will get the surface immediately shiny
- No glaze necessary

Gingival health

- Plaque can be easily removed
- Pleasant wearing comfort for patients

4 Record-breaking toughness and durability

Protemp™ 4 Temporisation Material is the best-in-class material in a test that simulates its durability under *in vivo* stress.

4.1 Material toughness

Material toughness can be measured as “fracture work” which shows the energy that a material can absorb until fracture. The higher this value the more likely the material will resist to fracture under stress. Compared with other leading temporisation materials (see Fig. 1), Protemp 4 temporisation material has the best material toughness values, i. e. shows the greatest resistance to fracture.

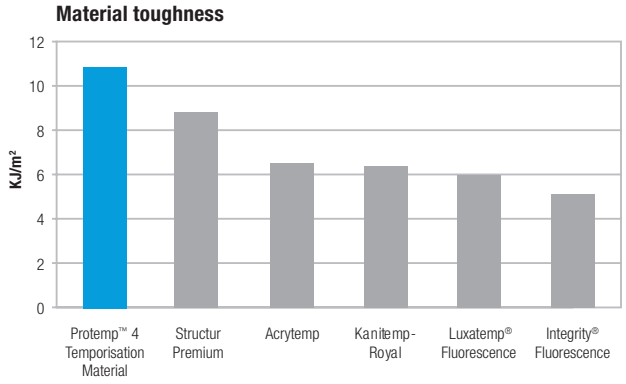


Fig. 1: In a test measuring material toughness, Protemp™ 4 Temporisation Material showed greater resistance to fracture than other tested temporisation materials.

Source: V. Babcic, R. Perry and G. Kugel, Tufts University, Boston, MA, U.S.A., AADR 2008, #0371

4.2 Fracture toughness (determined as K1c value)

Fracture toughness is a quantitative way of expressing a material’s resistance to crack propagation when a crack is present. The higher the value the higher the resistance of the material to fracture. Protemp 4 material shows considerably higher fracture toughness values than all other competitive temporisation materials tested.

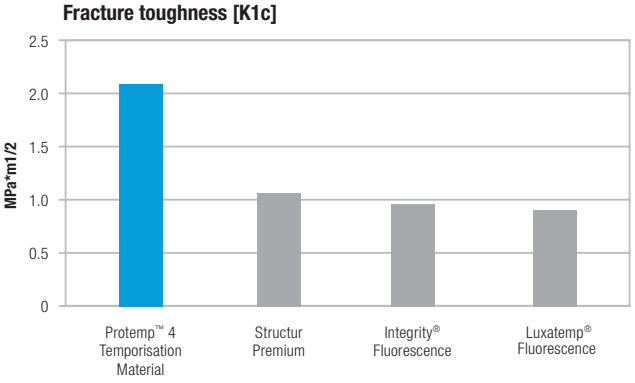


Fig. 2: Fracture toughness.

Source: Dr. Rosentritt, University of Regensburg, Germany – K1c value [MPa*m1/2] test

4.3 Mechanical strength under stress

The various toughness measurements indicate a higher chance of survival in real life for temporaries made with Protemp 4 temporisation material. To simulate this as close as possible to the *in vivo* situation, Protemp 4 material and other leading temporisation materials were subjected to mastication simulations. The lower the reduction of the mechanical strength after mastication – shown by the shortest bars – the more resilient and stronger the material. Among all materials tested, Protemp 4 temporisation material again showed best mechanical strength and maintained this mechanical strength even after prolonged stress.

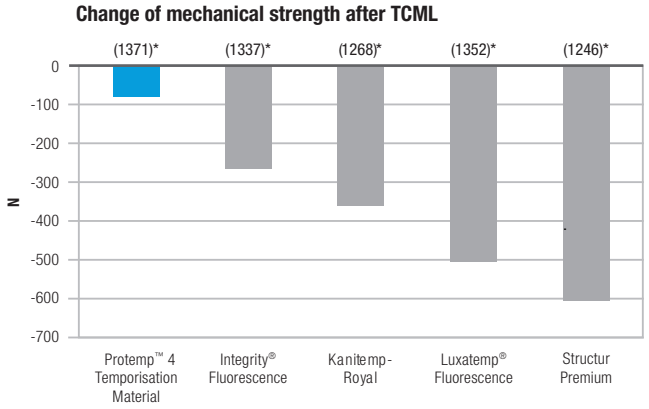


Fig. 3: Change of mechanical strength after thermocycling (5–55°C, 3,000 thermocycles) and mechanical loading (480,000 loading cycles; 100N).

Source: 3M ESPE internal TCML study results corresponding to 2 years mastication simulation with 3 unit-bridges.

* Mechanical strength of control group without TCML.

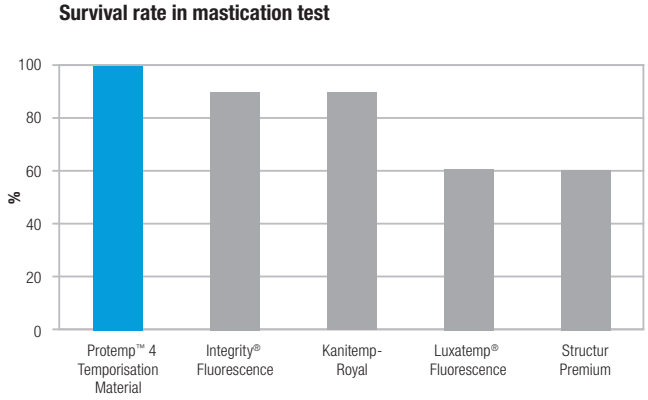


Fig. 4: Survival of 3-unit bridges in mastication tests: 10 samples of each product tested with 480,000 loading cycles (100N) and 3,000 thermocycles (5–55° C).

Source: 3M ESPE internal data

In a mastication simulation of 3 unit-bridges, the restorations made with Protemp 4 temporisation material clearly showed the highest survival rate.

4.4 Outstanding compressive strength

Mechanical study results comparing the compressive strength, i. e. the resistance to compression, of Protemp 4 temporisation material to leading competitive materials further confirm the excellent mechanical properties of Protemp 4 temporisation material.

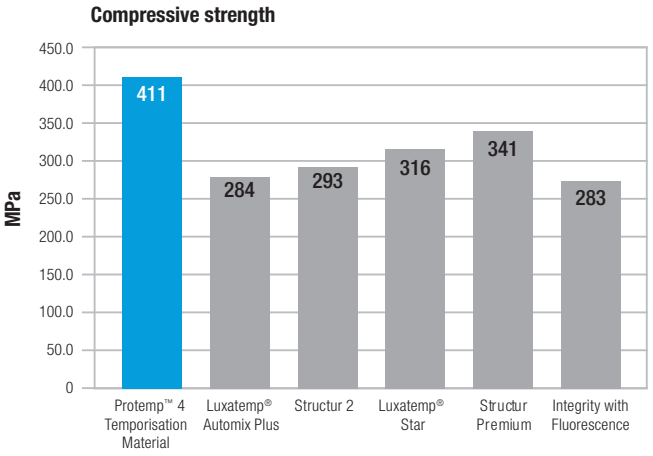


Fig. 5: Compressive strength (resistance to compression).

Source: 3M ESPE internal data

5 Outstanding aesthetics

5.1 Fluorescence close to nature

The fluorescence pigments of Protemp™ 4 Temporisation Material match very well with the fluorescence of natural teeth (see Fig. 6). Protemp 4 material allows the fabrication of temporaries that look naturally beautiful in various lighting conditions, also in challenging ultraviolet light.

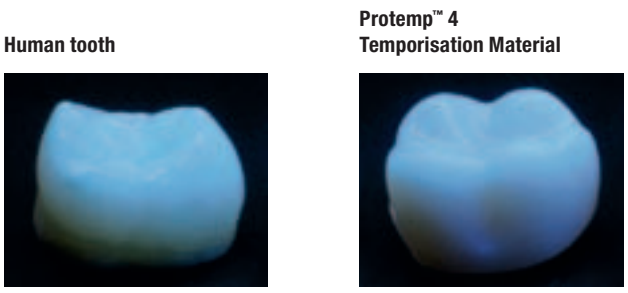


Fig. 6: Temporary single crown fluorescence compared to human tooth – Protemp™ 4 Temporisation Material looks almost the same as nature.

5.2 Six shades that match with Filtek™ Supreme XTE Flowable Restorative

Six fluorescent shades are available and designed to match with Filtek Supreme XTE flowable restorative:

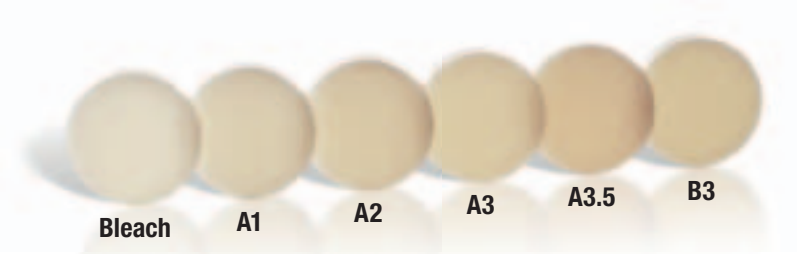


Fig. 7: Protemp™ 4 shades.

5.3 Gloss without polishing or glazing – a benchmark in surface quality

Due to its new sophisticated generation of fillers, 3M ESPE sets new industry standards. Right from the beginning, the unique surface quality of Protemp 4 Temporisation Material is obvious. Compared to competitive materials, the surface of Protemp 4 material is significantly smoother, as below AFM topography pictures show. Just wiping off with ethanol will get the surface glossy and shiny immediately, making the whole procedure faster as the polishing and glaze working step is no longer required.

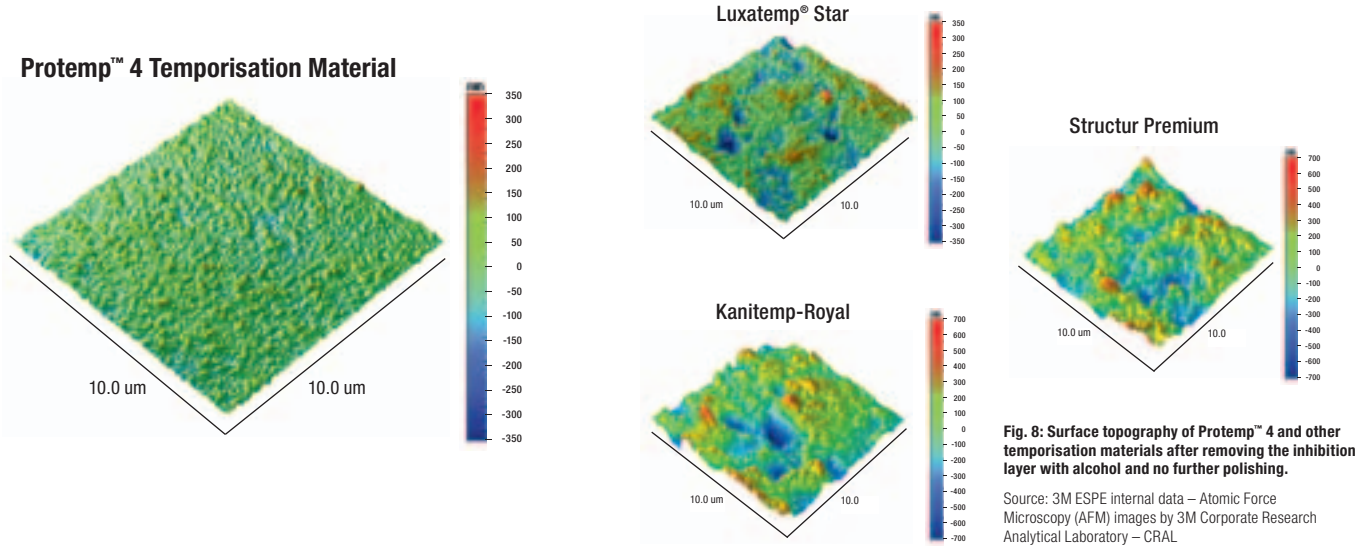


Fig. 8: Surface topography of Protemp™ 4 and other temporisation materials after removing the inhibition layer with alcohol and no further polishing.

Source: 3M ESPE internal data – Atomic Force Microscopy (AFM) images by 3M Corporate Research Analytical Laboratory – CRAL

5.4 Better colour stability

Thanks to its enhanced surface quality, Protemp™ 4 Temporisation Material resists staining and holds colour better than all other leading materials tested. After 3 days immersed in coffee at 36 degrees Celsius, the bridge made with Protemp 4 material shows the lowest colour change.

Fig. 9: Coffee test: 3 days immersed in coffee at 36° C.

Source: 3M ESPE internal data

6 Easier and faster handling and fabrication of temporaries

Tangibly less inhibition layer that is easier to remove

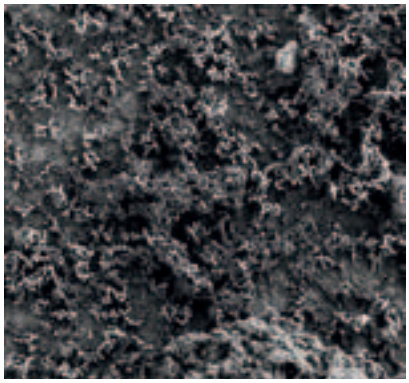
Compared to competitive bis-acrylic materials, Protemp™ 4 Temporisation Material has tangibly less inhibition layer that can be removed more easily. This leads to a simplified and faster finishing of the temporary restoration – without any messy or sticky procedures.

7 Gingival health

Easy to clean and high wearing comfort

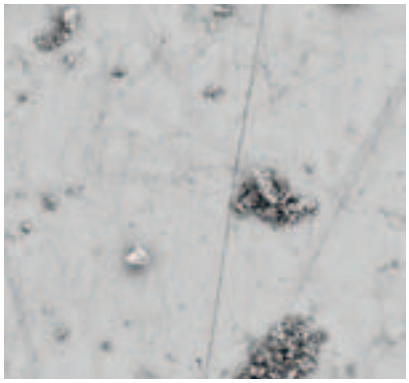
Due to the smooth surface of Protemp 4 temporisation material, patients have a high wearing comfort with Protemp 4 temporaries. Through its excellent surface quality properties plaque can be easily removed from Protemp 4 material – as a 3M ESPE *in vitro* experiment showed. In this experiment Protemp 4 material was incubated for 48 hours in full human saliva for plaque growth and then cleaned with tooth paste (Aronal®) on an electrical tooth brush (Oral-B® Professional Care® 5000) for 5 seconds.

Before cleaning



Surface with plaque before cleaning.

After cleaning



Cleaned surface showing only residual tooth paste abrasive particles.

Fig. 10: SEM images of Protemp™ 4 Temporisation Material surface before and after cleaning: 500 fold magnification.

Source: 3M ESPE internal data

8 High Standards – high marks

CLINICIANS REPORT™

CLINICIANS REPORT

96% of evaluators rated Protemp™ 4 Temporisation Material “excellent” or “good” and worthy of trial by colleagues. 78% stated they would incorporate Protemp 4 into their practice.

Comments:

- Quick intra-oral set – 1 minute, 40 seconds.
- Less need to polish – can be left in VPS for up to 5 minutes resulting in less oxygen inhibition.
- Temporaries are strong
- Easy handling and easy to use
- Good variety of shades

DENTAL PRODUCT SHOPPER

This journal designated Protemp™ 4 material as a “Best Product/2009” and a 4.5 rating on its scale of 0–5.

Comments:

- Strength: 4.5
- Aesthetics: 4.6
- Material handling: 4.6
- Ease of use: 4.7
- Oxygen inhibition layer: 4.1
- Polishability: 4.7
- Colour stability: 4.8
- Plaque removal: 4.6
- Speed and simplicity of technique: 4.6
- Fluorescence: 4.1
- Instructions: 4.6
- Packaging: 4.5
- Overall satisfaction: 4.4
- **Average rating: 4.5**

REALITY NOW

A 2009 issue of this publication gave Protemp™ 4 Temporisation Material a 5 star rating (4.5).

Comments:

- Shines with alcohol if you don’t finish it
- Nice consistency and handling

THE DENTAL ADVISOR

The November 2009 issue gave Protemp 4 temporisation material a ++++1/2 rating.

Comments:

- Easy to use and produces a very strong and durable temporary restoration.
- Superior marginal detail and resistance to distortion/tearing.
- Gloss is adequate without polishing for posterior provisional restorations; anterior restoration need minimal polishing.
- Shades are good but are bright (high value) and opaque
- Sticks to adjacent teeth

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THE DENTAL ADVISOR

In a one-year long-term test, Protemp 4 has been awarded 5+++++ by THE DENTAL ADVISOR (2011): Protemp 4 exhibits an excellent overall performance and particularly high fracture toughness, outstanding aesthetics and gingival health.

Comments:

- Protemp 4 provided excellent marginal adaptation.
- Several patients totally forgot they had a temporary.
- Protemp 4 was excellent during implant placement and healing period.
- I used a flowable composite veneer to enhance anterior aesthetics.
- Best material that I have seen for long-term temporisation with great results.

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www.3MESPE.com

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