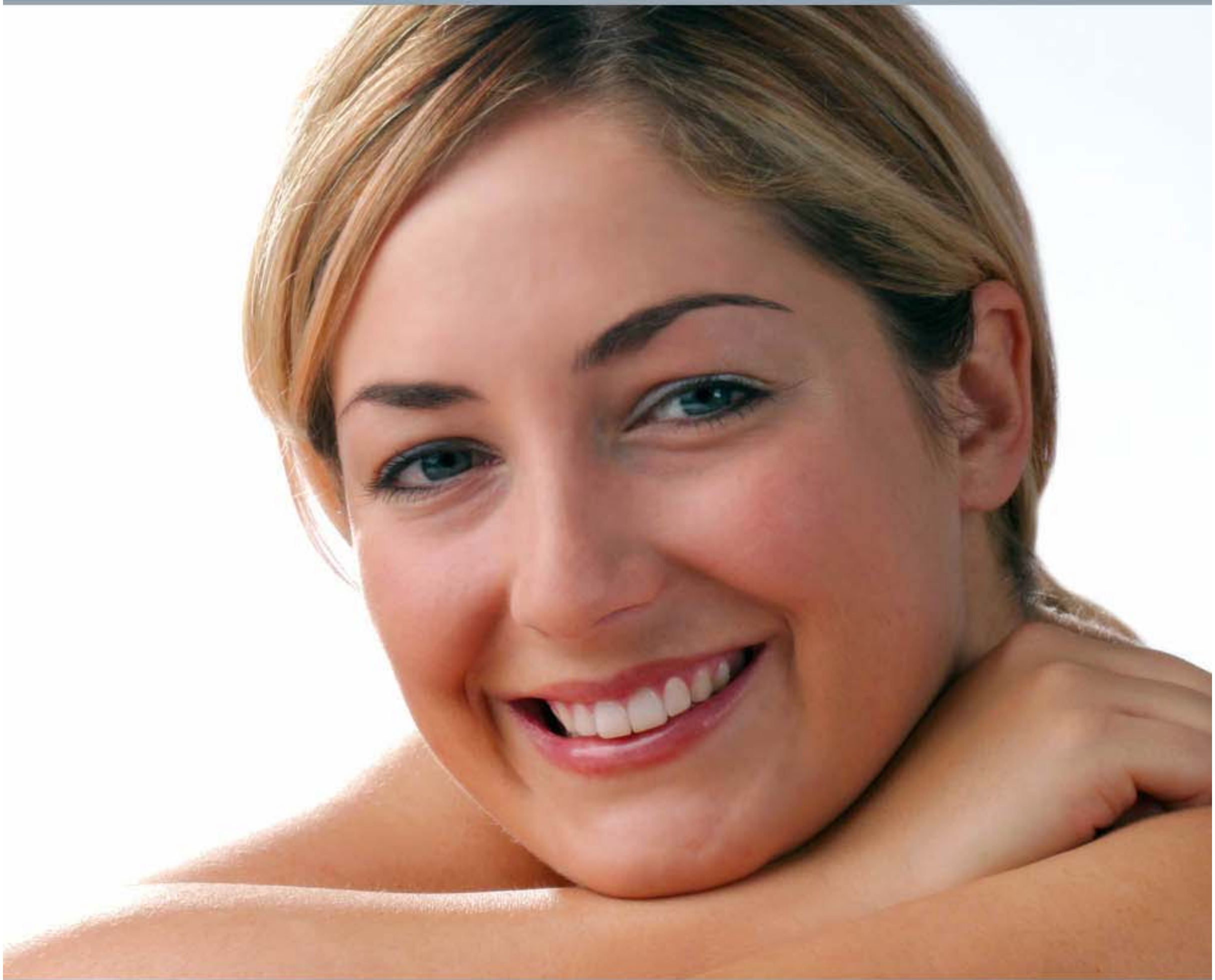
Systemp®.link

Even temporary smiles can be beautiful.



Scientific Documentation

Table of Contents

1. Introduction

1.1 Temporary restorations

Temporary restorations represent an essential treatment step in the production of permanent tooth replacements. They efficiently and reliably protect the exposed dentin surfaces and are not harmful to the pulp. Additionally, they secure the involved teeth in position. The benefit for the patient is that the phonetic, aesthetic and masticatory functions of the teeth are maintained. Moreover, temporary restorations serve as diagnostic tools for the dentist and enable a re-assessment of the planned permanent restoration. As in other fields, increased importance is being attached to the precision of fit and biocompatibility of temporary materials today.

1.2 Temporary luting materials

Temporary luting materials ensure optimum adhesion of the temporary restoration to the tooth structure. Their task is to hold provisional crowns, bridges or inlays firmly in place until the permanent restoration is ready to be fitted. In contrast to permanent luting materials, for which high adhesive strength is a must, temporary cements should allow the dentist to easily remove the provisional restoration. Many temporary cements are zinc-oxide eugenol-based materials. Eugenol exerts a sedative effect on the pulp and provides pain relief. However, the substance may trigger allergies. In addition, it inhibits free-radical polymerization. Eugenol-containing temporary cements should thus not be used, if the final restoration is to be permanently cemented using adhesive procedures.

Due to their high degree of translucency and natural-looking shade, resin-based temporary luting materials ensure aesthetic results and demonstrate higher adhesive strength than conventional cements.

1.3 Systemp.link

Systemp.link is a dual-curing temporary luting composite. It is supplied in double-push syringes containing 6 g. Due to the content of the initiator, which is responsible for the self-curing process, System.link must be stored in the refrigerator.

2. Technical data

Standard composition	**(in wt%)**	
Base:		
Dimethacrylates	54.7	
Fillers	43.0	
Catalysts, Stabilizers and Pigments	2.3	
Catalyst:		
Dimethacrylates	56.0	
Fillers	43.0	
Catalyst	1.0	

Physical properties

Compressive strength	28 – 36	MPa
Shore D hardness	42 – 50	
Working time (23 °C)	140 – 170	sec
Setting time (37 °C)	240 – 300	sec

3. *In-vitro* investigations with Systemp.link

There are no standards for temporary luting materials that set forth a definition of the required physical properties and their measurement. However, the quantification of physical properties is a difficult task. On the one hand, temporary cements should possess good retentive and aesthetic properties to ensure reliable and invisible adhesion to the tooth structure. On the other, the removal of temporary restorations should be easy and pain-free, as they are only supposed to stay in the mouth for a limited period of time. Below, a number of examinations are listed that provide a definition of various key properties and their measurement and thus enable the assessment of Systemp.link in comparison with other temporary cements.

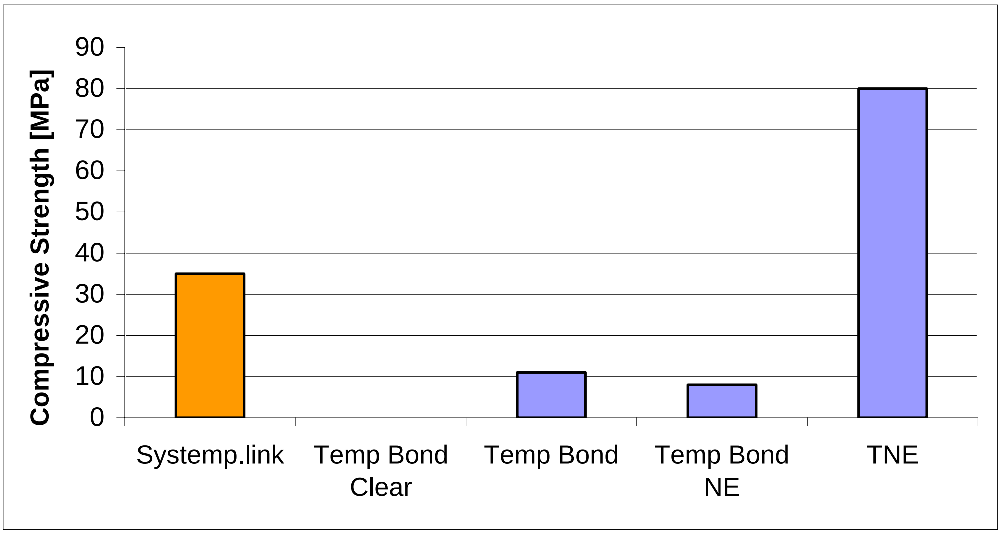
3.1 Compressive strength

Compressive strength is measured to determine the resistance of the cement while the temporary restorations are exposed to the forces of mastication. A standardized investigation method is described in ISO 3107. Disc-shaped test specimens are densely packed to exclude any inhomogeneities and porosities. The discs are immersed in water at 37 °C/98 ° F for 24 hours and subsequently loaded to fracture at 23 °C. The maximum load applied upon fracture is recorded.

Compressive strength is calculated based on the following formula:

$$K = \frac{4\ F}{\pi\ d^2}$$

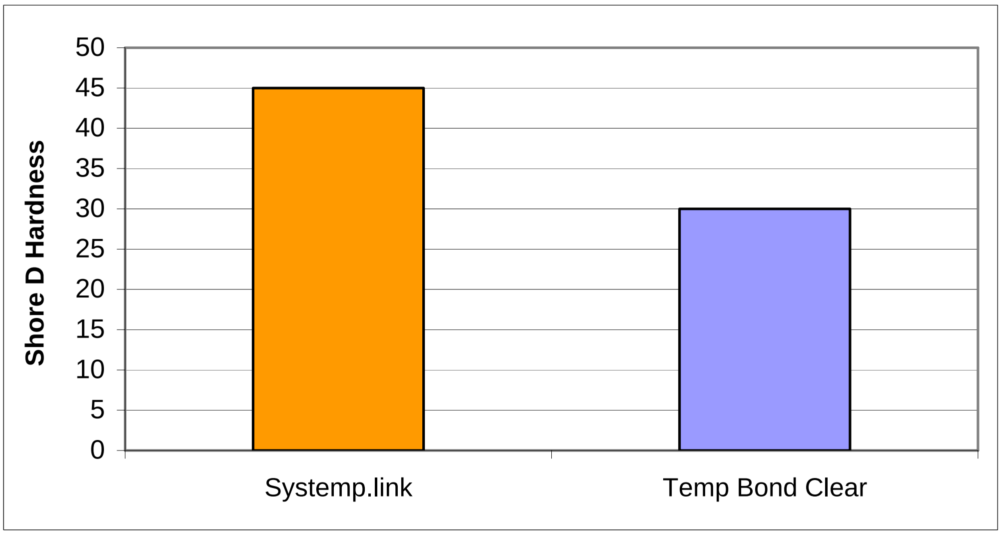
F = maximum load applied
d = diameter of the test specimen



Considering that Systemp.link is a temporary cement, it shows acceptable compressive strength values. The compressive strength of Temp Bond Clear could not be measured.

3.2 Hardness testing - Shore D hardness

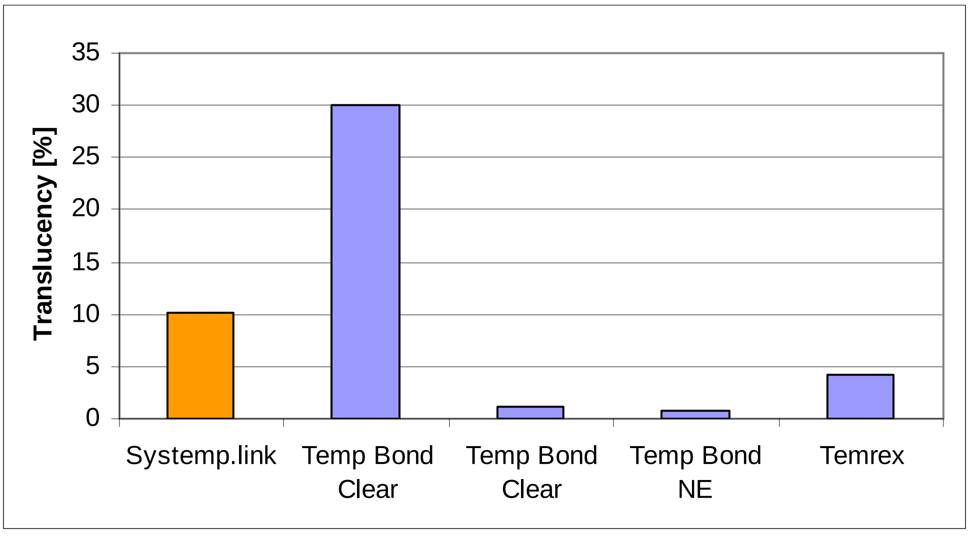
The hardness of resin-based materials is a measure for the degree of cross-linking or monomer conversion achieved. In dental polymers, this generally refers to the formation of methacrylate double bonds. Particularly in the case of self-curing and dual-curing composites, complete polymerization is dependent upon several factors such as the type of monomers employed or the efficiency of the initiator system. The measurement of Shore D hardness is described in DIN Standard 53 505.



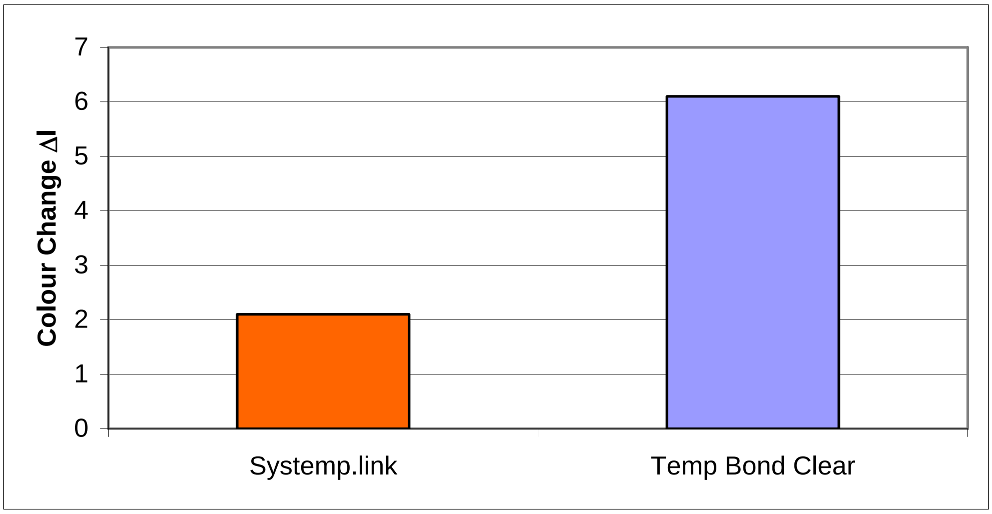
Systemp.link proves to be at least equally as good as Temp Bond Clear as far as Shore D hardness is concerned.

3.3 Translucency and tendency to discoloration

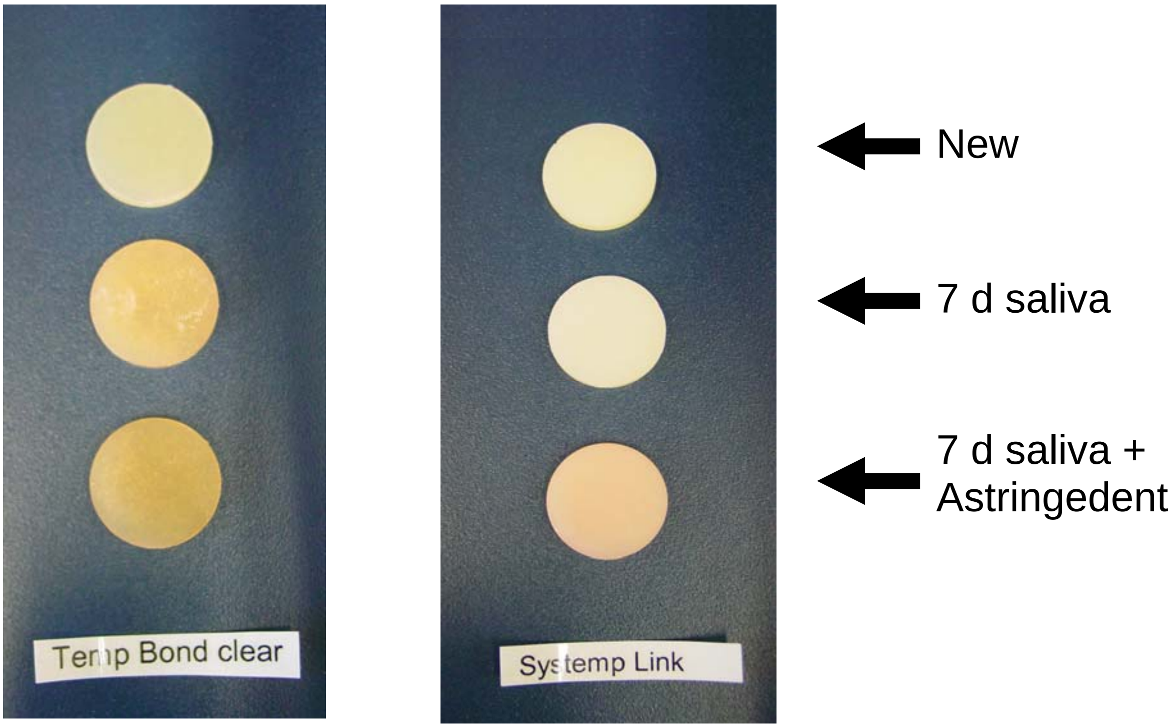
Translucent, light-transmitting materials are hardly discernible once placed in the mouth. A highly translucent, aesthetic appearance of the cement layer is particularly desirable for indirect restorations with cervical margins that are located supragingivally.



The translucency of Sytemp.link is comparable to that of other temporary composite luting materials. In this test, the initial translucency was measured. The resistance of translucency and shade to oral conditions is of course equally relevant.



Following immersion in artificial saliva at 37 °C/98 °F for seven days, Systemp.link exhibited a colour change that was barely discernible to the naked eye, while Temp Bond Clear showed significant discoloration. The translucency of the latter was also substantially reduced.



The presence of hemostatic agents may also cause discoloration of the cement. However, drastic environmental conditions were chosen for these test series in order to produce an apparent change of colour. Under simulated oral conditions, Systemp.link showed excellent results compared to Temp Bond Clear[1].

[1] Temp Bond, Temp Bond Clear and Temp Bond NE are registered trademarks of Kerr, TNE is a registered trademark of Temrex and Astringedent of Ultradent.

4. Clinical assessment

Clinical tests with Systemp.link were conducted by practising dentists in North America and Europe, who compared the product to Temp Bond Clear from GC, the current market leader in the field of temporary luting composites. These tests comprised an evaluation of the consistency, shade, excess removal, adhesion and removability. Overall, the handling properties were rated good to excellent. The properties of Systemp.link are comparable to those of the current market leader.

5. Biocompatibility

The monomers employed in Systemp.link are all methacrylate-based and used in a wide array of dental materials. Additionally, the cytotoxic [1] and mutagenic effects [2] of Systemp.link were investigated. Both tests showed that Systemp.link represents no risk from a toxicological viewpoint when used according to the instructions for use.

[1] RCC CCR #817'301 (2004): Examination report on XTT test
[2] RCC CCR #817'302 (2004): Examination report on Ames test

6. Literature

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Permanent and Temporary Cements

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Issued: January 2005