SCIENTIFIC REPORT

Structur Premium – Curing

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The process of chemically curing provisional crown and bridge materials and the resulting mechanical parameters in the initial hours and days after application was examined in a study at the University of Giessen (Germany).

In most studies that analyse the mechanical parameters of provisional crown and bridge materials, the values are determined after a long curing period. These values are thus determined at a specific time, for which complete curing of the material is assumed. In most cases, however, the temporaries are already inserted after only a short amount of time (10-20 minutes after fabrication). Since the chemical curing of methacrylates progresses considerably slower than a reaction under light irradiation, it is quite possible that the material is not yet completely cured at the point in time the temporary is inserted. In a university study, the course of the conversion rate (in % reacted double bonds), the transverse strength and flexural modulus in the first three days were more closely examined.[1]

Transverse strength

In figure 1, the transverse strength of 4 analysed, provisional materials in the course of the first 2 hours after mixing is diagrammed.

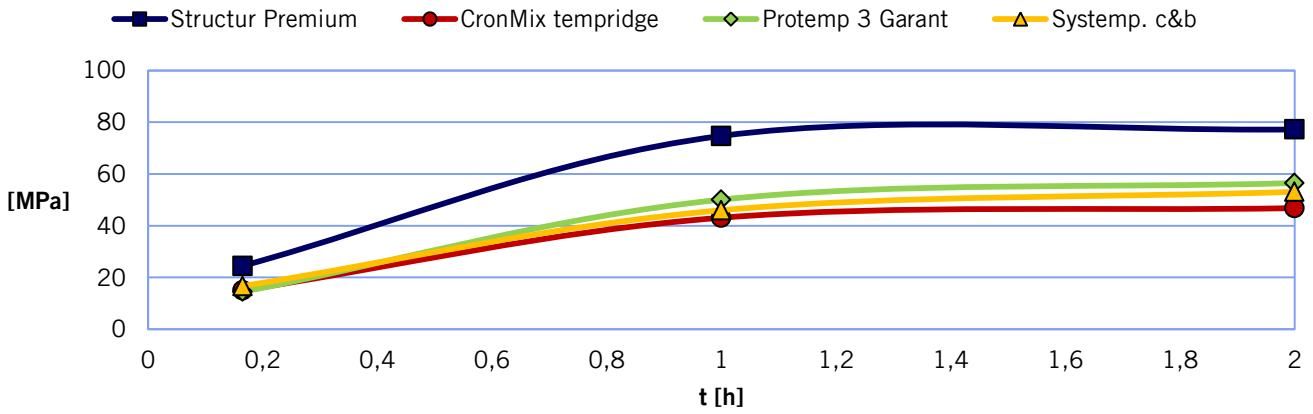

Figure 1: Shear bond strength of various luting materials (24 h, 37 °C water storage, then thermocycling 6/60 °C, 1000 cycles)

That the curing of all of the examined materials was not yet complete 10 minutes after application was visible at first glance. The values were between 14 and 25 MPa at this early point in time. The dentist therefore should always advise patients not to fully load the temporary during the first hour after insertion. After an hour, the value for Structur Premium had already reached 74.4 MPa. Protemp 3 barely exceeded this value when completely cured and two other products tested did not reach this value

even after curing was complete. The transverse strength of Structur Premium rose to 109.6 MPa during the course of curing (Figure 2) after three days. The development of the flexural modulus of all materials progressed analogically to the transverse strength.

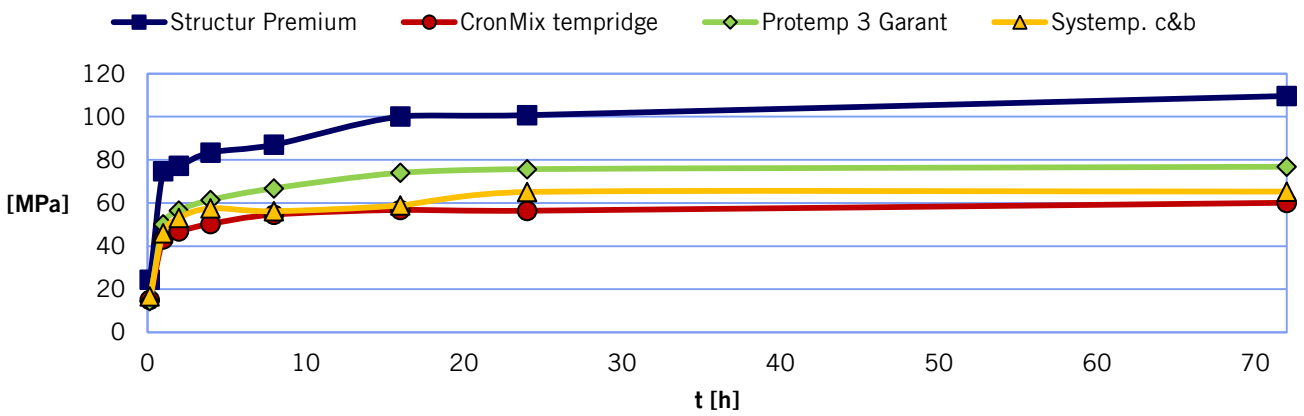

Figure 2: Transverse strength [MPa] in the first 3 days after application

Rate of conversion

The rate of conversion is often regarded as a measurement for the process of curing, in which a high conversion of double bonds is equated with complete curing. It is also often postulated that only a high conversion brings about good mechanical properties. The study presented here reaches a different conclusion. After 24 hours, the rate of conversion for Structur Premium is merely 51.4%, while it is around 70% for the other three materials. Yet Structur Premium distinguishes itself with the better values concerning the transverse strength and flexural modulus. This shows that the conversion of double bonds alone does not represent an adequate assessment criterion. Rather, how many double bonds are contained per monomer, to what extent prepolymerisates are used and how the monomer distribution is generally obtained must be considered. The rate of conversion alone does not have any clinical relevance.

Conclusion: Structur Premium, the temporary crown and bridge material, has a high transverse strength shortly after application that continues to rise during the course of curing. It is thus possible for the patient to fully load the temporary only an hour after application, without worrying about damaging it.

[1] M. Balkenhol, P. Ferger, M. C. Mautner, B. Wöstmann, *Dent.Mater.* **2007**, *23*, 1574-1583.