

Temperature changes in one-piece implants due to provisional restoration. The effect of implant diameter. An in vitro study

*Ofar Moses, *Shimshon Slutzki, **Shlomo Matalon, *Omer Cohen

*Dep. of Periodontology & Dental Implantology, **Dep. Of Prosthodontics

School of Dental Medicine, Tel Aviv University, Israel.

Topic: Basic research

Background

Limited number of studies investigated heat production during provisional restoration of implant abutment. Exposure of osteoblast culture to 42 °C induced activation of apoptosis mechanisms

To the best of our knowledge, heat production during provisional restoration of one-piece implants was never studied before.

Objectives

To evaluate changes in temperature of one-piece titanium implant surface during the setting of acrylic resin temporary crowns and to correlate thermal changes to implant diameter.

Methods and Materials

Thirty-three one-piece implants (ARRP, Alpha-Biotec, Israel) were divided into 3 groups according to diameter size (G1=3 mm, G2=3.3 mm, G3=3.6 mm). Implants were mounted on an acrylic glass apparatus.(Fig 1.) Thermocouples were positioned at the most coronal thread. Lower incisor temporary polycarbonate crowns were filled with 80 µL of self-curing acrylic resin and positioned immediately on the implant abutment.(Fig 2.) Thermal changes of the implant surface were recorded continuously for 10 minutes. Data were statistically analyzed using one-way analysis of variance.

Results

The mean initial temperature (C0) of groups G1, G2 and G3 was similar (24.79±0.78°C, 25.26±0.63°C, 24.97±1.06°C, respectively). (Fig 3). The setting of the acrylic resin temporary crown resulted in a significant increase in the implant surface temperature of all groups. The mean thermal amplitude (ΔC) for groups G1, G2 and G3 were 6.79±1.02°C, 6.61±0.94°C, 6.65±1.26°C, respectively. The mean time to maximum temperature (Tmax) for groups G1, G2 and G3 were 337.38±42.91 seconds, 324.69±41.46 seconds and 317.98±37.91 seconds respectively (P>0.05). (Fig 4.)

Conclusions

Direct application of auto-polymerizing resin to the titanium abutment of one-piece implants significantly increased the cervical implant surface temperature. Implant diameter did not influence the temperature changes.

Clinical relevance

To avoid thermal injury to the surrounding bone it is recommended to constantly cool the implant with water spray during the setting of the provisional restoration.

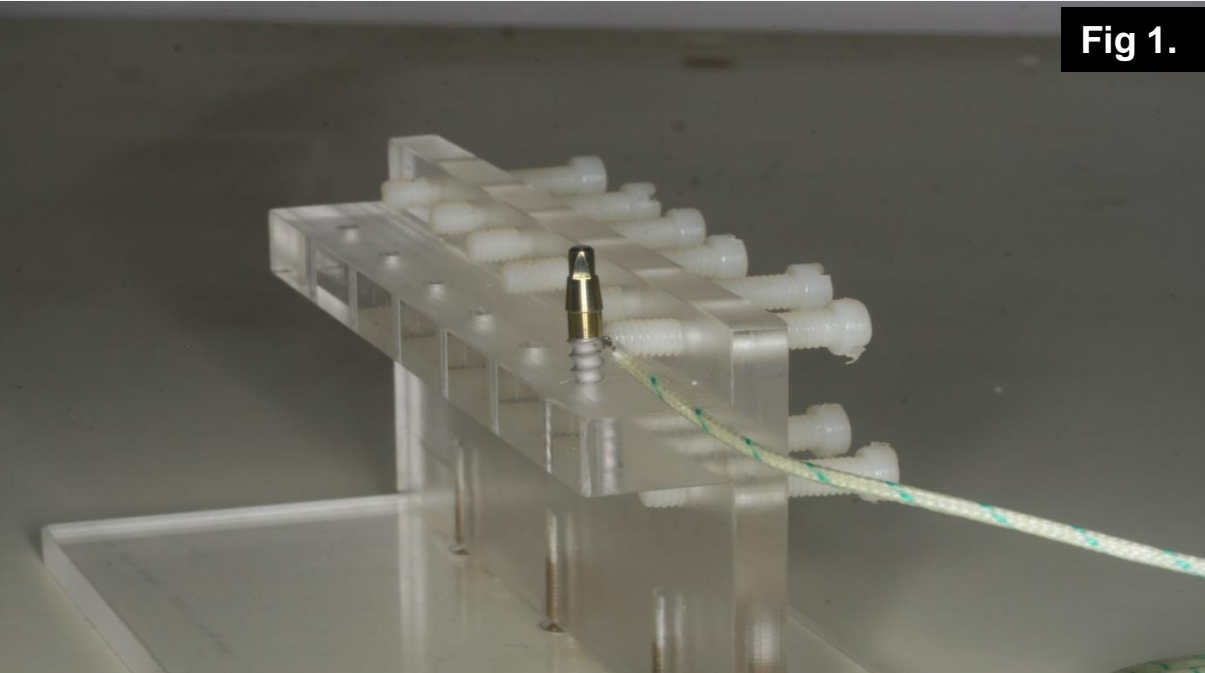


Fig1. Mounting and fixing of an implant into machined slots in a custom-made acrylic glass apparatus

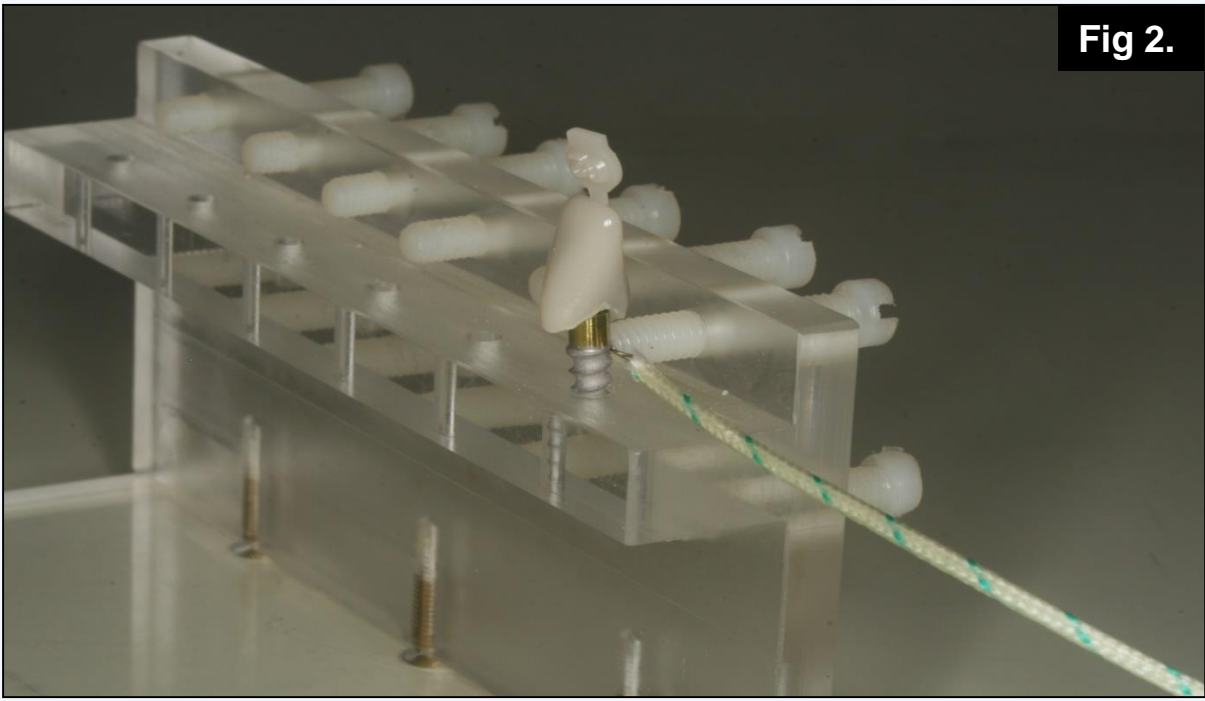


Fig2. Placement of the filled crown on the implant abutment while ensuring that no resin flows on the implant surface.

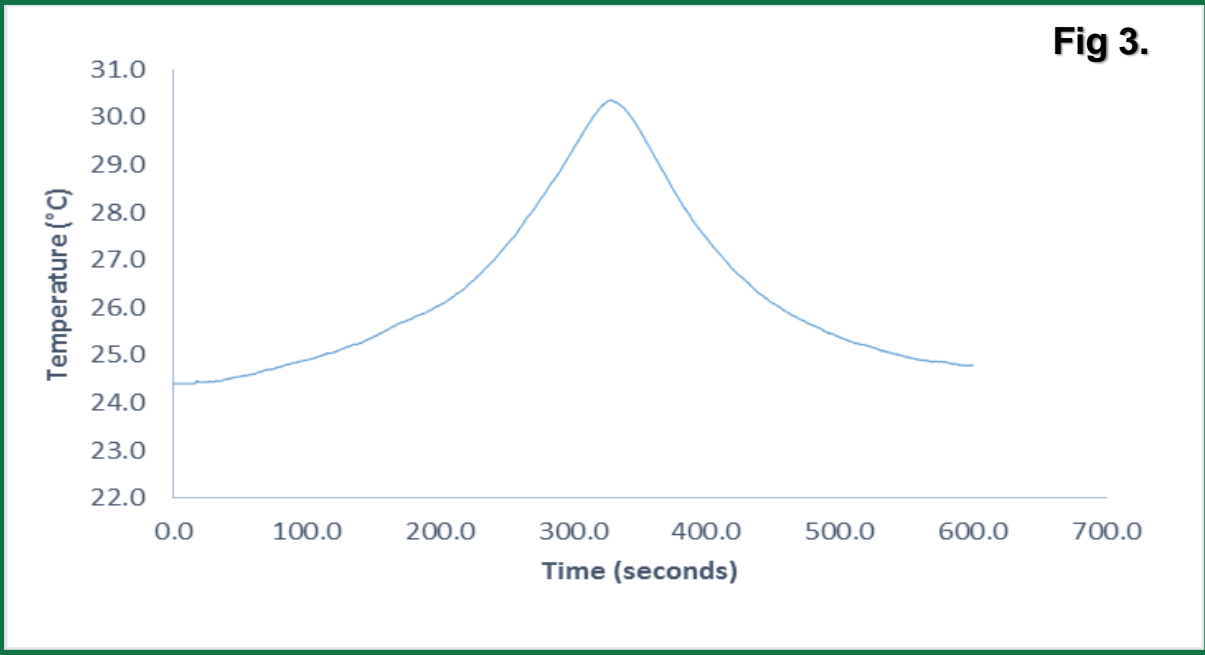


Fig 3. An example of recorded temperature over time. The thermal amplitude (ΔC) was calculated by subtracting the initial change (C0) from the maximum change (Cmax).

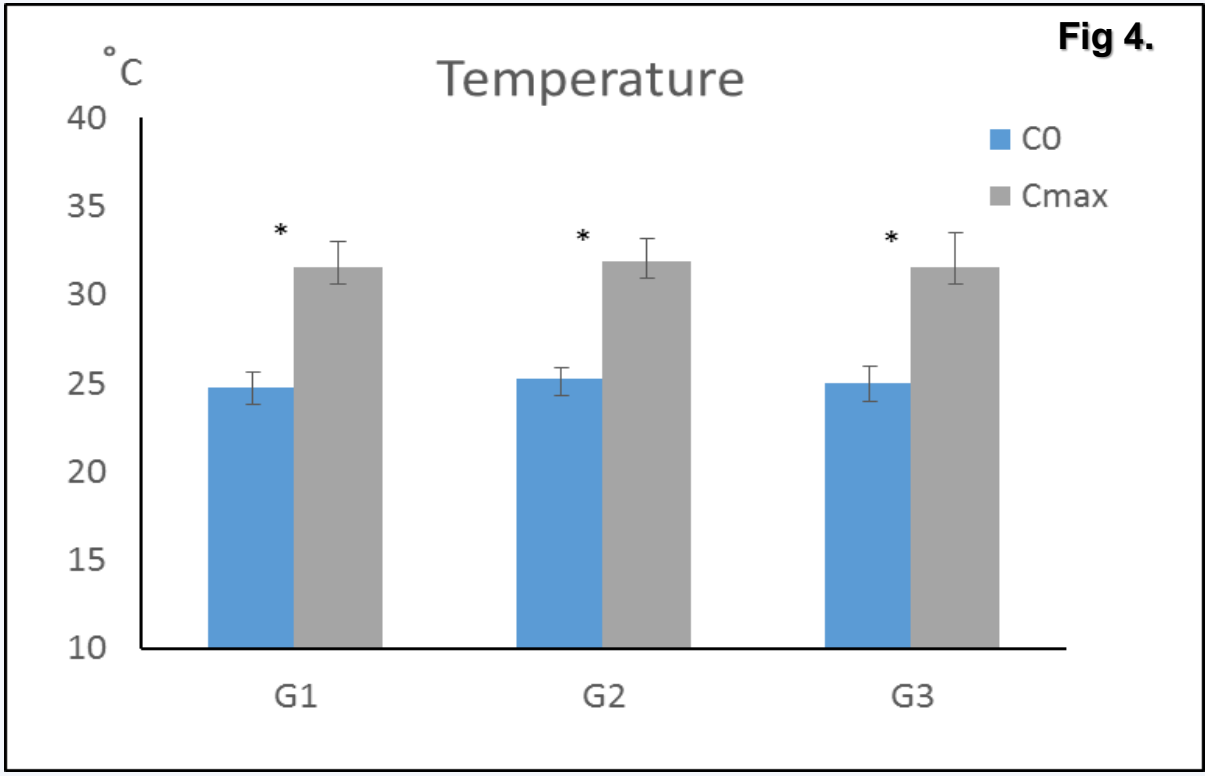


Fig. 4 Baseline (C0) and maximal temperature (Cmax) recorded in groups: G1 (3.0 mm-implants), G2 (3.3 mm- implants), G3 (3.6 mm-implants). Data presented in Celsius degrees as mean value and standard deviation. * denotes *p*<0.05

References

1. Prithviraj DR, Gupta V, Muley N, Sandhu P (2013). One-piece implants: placement timing, surgical technique, loading protocol, and marginal bone loss. J Prosthodont 22:237-244.

2. Parel SM, Schow SR (2005) Early clinical experience with new one-piece implant system in single tooth sites. J Oral Maxillofac Surg 63:2-10

