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## MEASUREMENT OF THE EXTERNAL SURFACE TEMPERATURE OF ROOTS

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**Abstract.** : *Introduction: Some procedures in Dentistry cause an increase in the external temperature of the root. If the temperature rise is above 10°C, permanent damage can be caused to the periapical tissues. The objective of this work was to perform the measurement of the temperature variation of the external root surface during the prosthetic preparation for fiberglass posts. Experimental procedure: 40 samples were divided into 4 experimental groups: G1: Non-fragilized and non-irrigated roots; G2: Non-fragilized and irrigated roots; G3: Fragile and non-irrigated roots; G4: Fragile and irrigated roots. The samples were placed in a plaster mold with a preheated water recirculation system at 39 ° C, simulating live conditions and followed by the prosthetic preparation for intraradicular post and the acquisition of data. Results and discussion: It was observed that there is a higher temperature increase in the apical thirds in all group. Conclusion: All experimental situations demonstrate a critical pattern in relation to maximum established temperature variation of 10°C. In the groups with irrigation, the temperature increase control was satisfactory, but it was observed that the temperature difference is still reached in the first stage of operation, regardless of the subsequent effects of operation.*

**Keywords:** *Temperature, roots, fiberglass post*

### 1. INTRODUCTION

Among several causes, teeth may present the need to perform endodontic treatment and subsequent prosthetic rehabilitation during their lifetime. The endodontic process consists of the decontamination of the root canal, removal of dental pulp residues and subsequent filling of this conduit with a material called gutta-percha. In cases requiring intradicular posts and prosthetic crowns, the prosthetic rehabilitation preparation of these teeth uses rotatory instruments inside the root canal that, during the internal preparation of the walls, generates an increase of the external temperature of the root's surface, which is transmitted to the periapical tissues. It is known that an increase of 10 ° C can cause irreversible

damage to periodontal ligaments and alveolar bone around the teeth, which can lead to dental aequiloses and bone resorptions (Erikson and Albrektsson, 1983; Saunders and Saunders, 1989). Post preparation is a delicate procedure that generate the most heat (McCullagh *et al.*, 2000; Lipski *et al.*, 2010), requiring accuracy for minimal heat generation.

The aim of this study was to measure the temperature variation of the external root surface during the prosthetic preparation for fiberglass posts.

## 2. EXPERIMENTAL PROCEDURES

After selection and endodontic treatment of the teeth, the 40 samples were divided into 4 experimental groups: G1:Non-fragilized and non-irrigated roots; G2:Non-fragilized and irrigated roots; G3:Fragile and non-irrigated roots; G4:Fragile and irrigated roots. The samples were then inserted into an apparatus specifically developed to attempt and simulate normal oral conditions. The samples were placed in a plaster mold with a preheated water recirculation system at 39°C. The chosen teeth positions to measure temperature were the apical 1/3 mean and cervical 1/3, where two thermistors were positioned. The used NTC 10 k term thermistors were calibrated for a temperature range between 25 and 50°C, and the monitoring and data acquisition were performed using a QuantumX 840A HBM acquisition module. The used steps consisted of prosthetic preparation for intraradicular post with the aid of a Largo drill and a specific drill of the fiberglass pin kit, coupled to a dental implant motor, with rotation speed at 8,000 rpm. The drilling working time using a Largo drill was divided into 2 stages, namely T1 during the first 25 seconds and T2 during 25 and 35 seconds. The third stage, the preparation of the conduit using the fiberglass post kit, lasted 20 seconds (from 35 to 55 seconds). In groups G1 and G3, only the Largo drill bit was exchanged for the fiberglass pin kit drill, whereas in groups G2 and G4, in addition to the drill exchange, roots were internally irrigated with chlorhexidine 2% solution for 5 seconds. The measurements were performed individually and then analyzed and interpreted.

## 3. RESULTS AND DISCUSSION

The temperature measurements results from all groups and thirds are displayed from figure 1 to figure 8. It was observed that there is a higher mean temperature rise in the apical thirds in all groups. As the smallest diameter of the root canal is located in this region, the likely decisive point for this temperature increase is due to the resistance to drill work. Refrigeration presented cooling properties relevant to the process.

### 3.1 Figures and tables

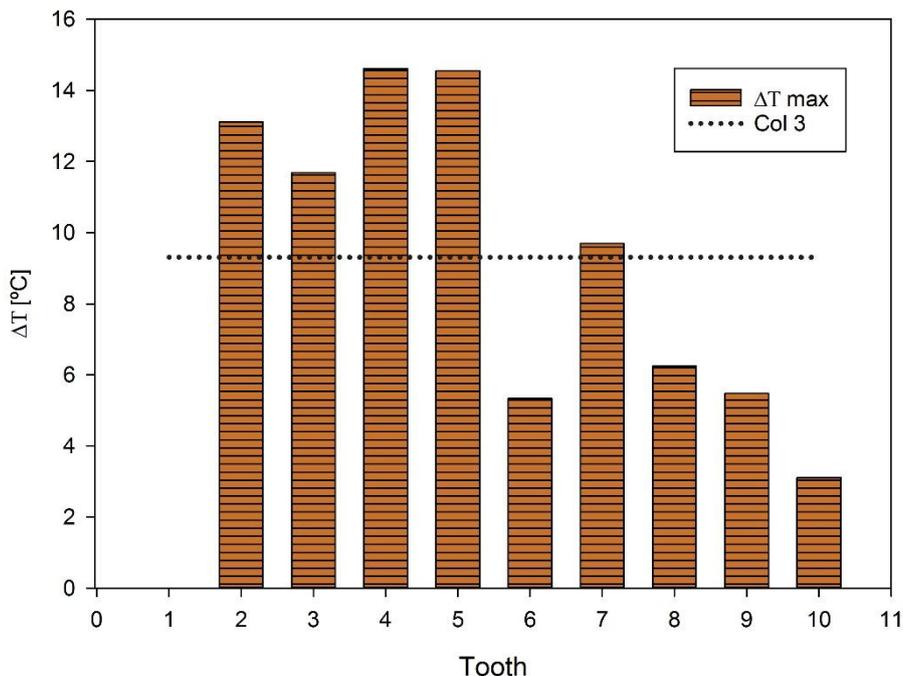


Figure 1. Maximum temperature variation in G1, apical third

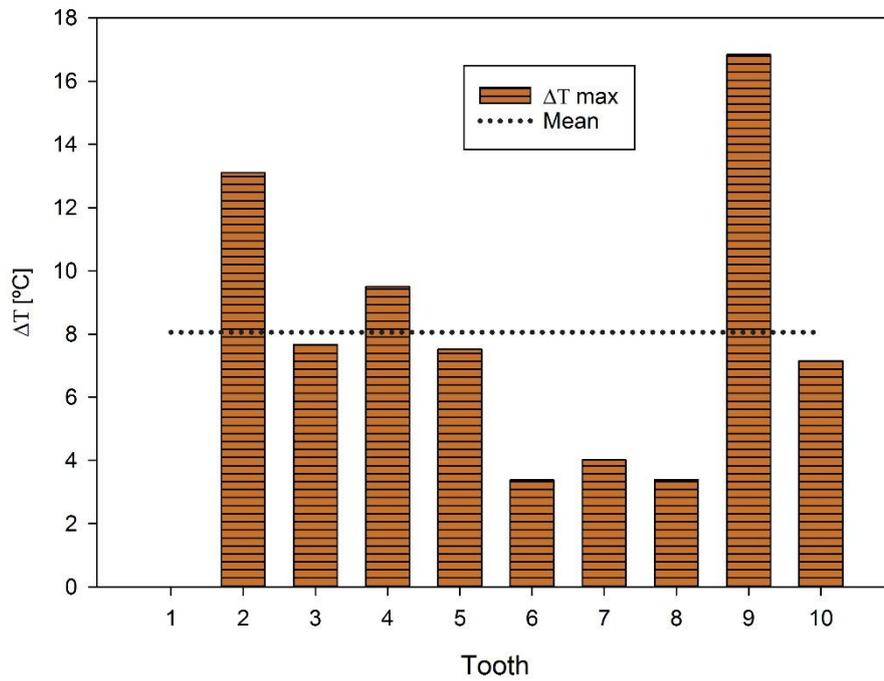


Figure 2. Maximum temperature variation in G1, cervical third

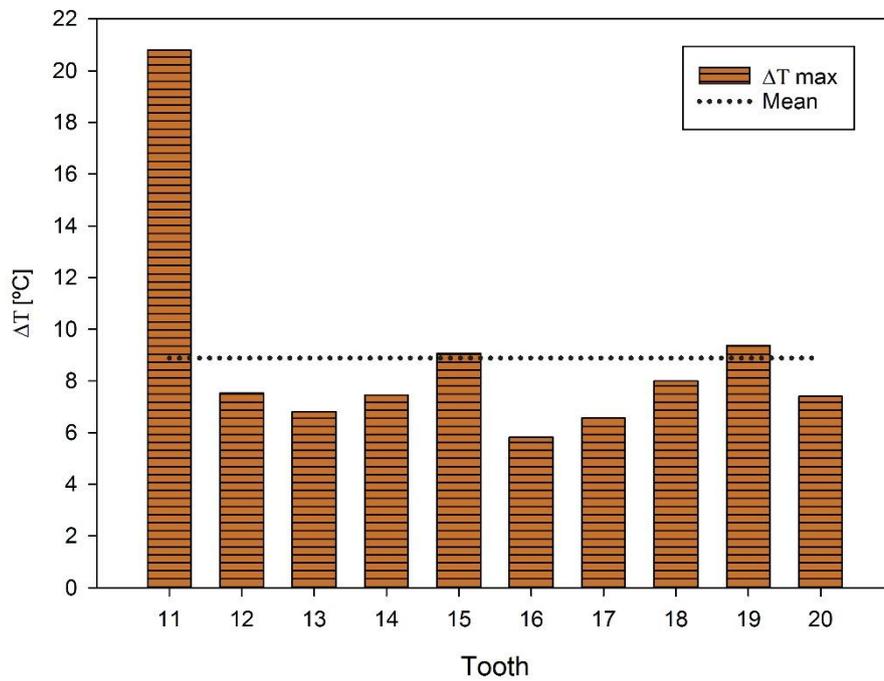


Figure 3. Maximum temperature variation in G2, apical third

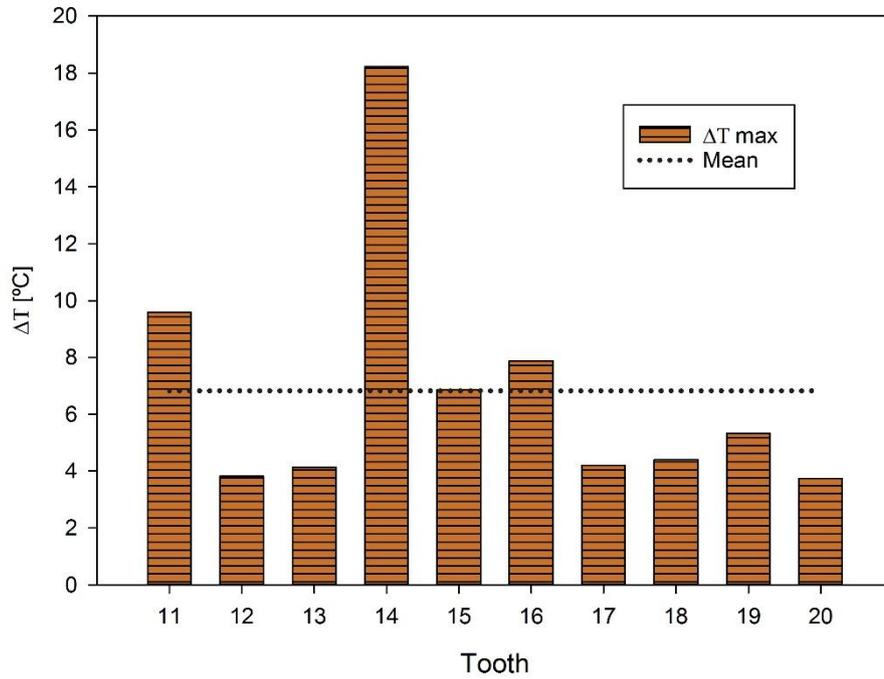


Figure 4. Maximum temperature variation in G2, cervical third

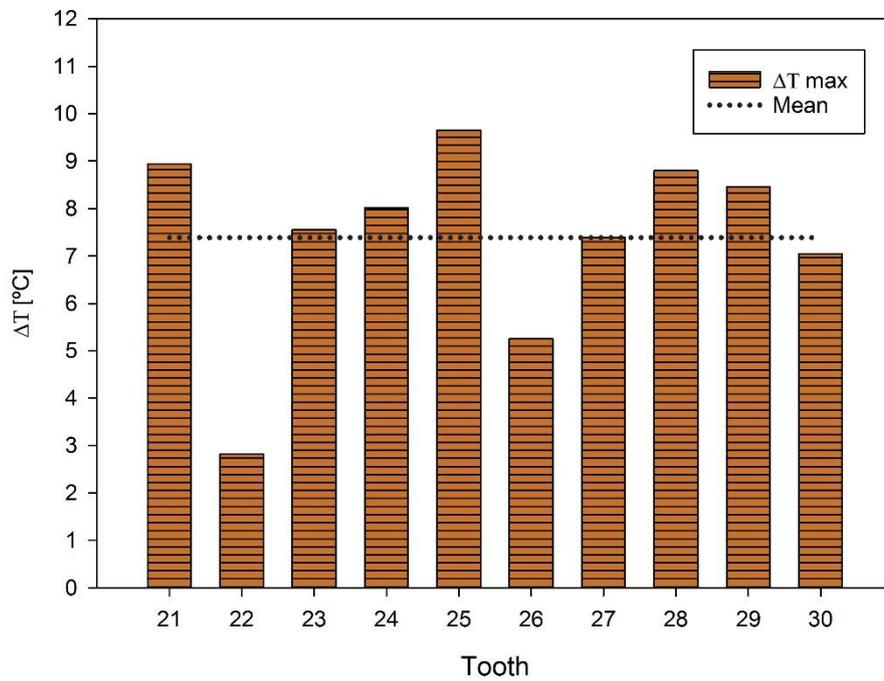


Figure 5. Maximum temperature variation in G3, apical third

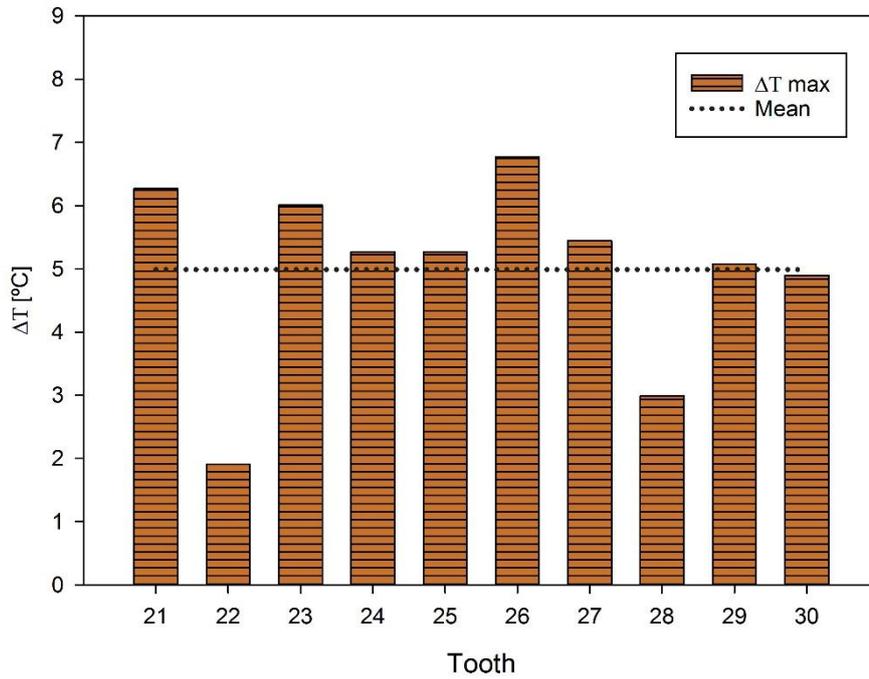


Figure 6. Maximum temperature variation in G3, cervical third

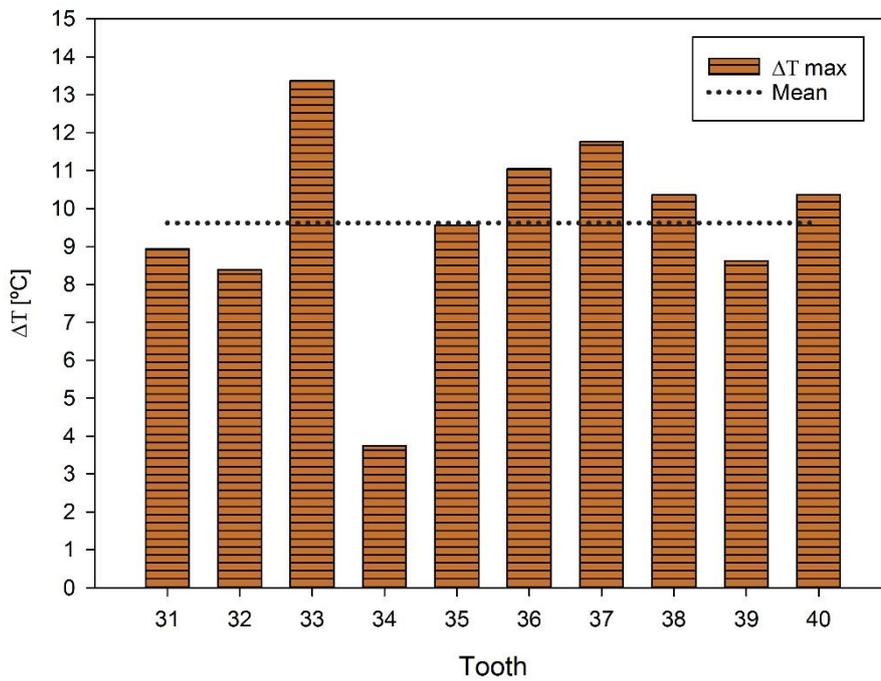


Figure 7. Maximum temperature variation in G4, apical third

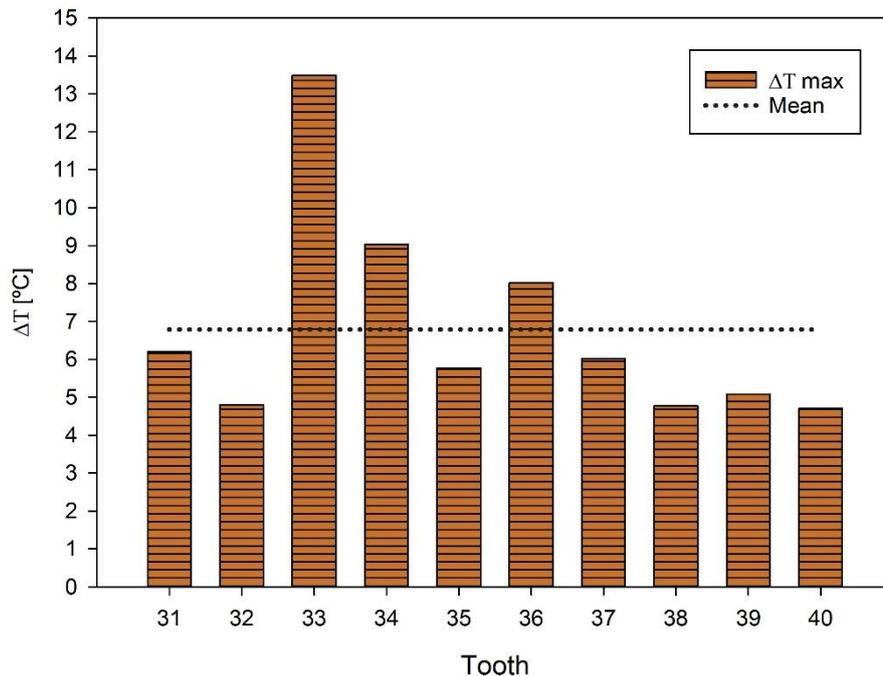


Figure 8. Maximum temperature variation in G4, cervical third

#### 4. CONCLUSION

All situations demonstrate critical pattern regarding the maximum established temperature of 10°C. The control of temperature increase was satisfactory in groups which were irrigated, but it was observed that the temperature difference is reached in the first stage of time operation, independent of the following procedures. assuring a lower risk margin, an operating protocol with a new interval and a new irrigation phase is suggested.

#### 5. REFERENCES

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#### 6. RESPONSIBILITY NOTICE

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