

# Influence of different parameters during polishing: a pilot study with 10 dental technicians

**Language:** English

**Authors:**

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**Introduction**

A surface as smooth as possible is unavoidable. Admittedly, the mirror finish during the CAM process is not possible yet. In this way polishing with the aid of a dental hand-piece is a really alternative to the conventional final firing for dental ceramics.

**Objectives**

The aim of this study was to examine different parameters during the dental polishing process (Fig. 4) by ten different dental technicians concerning their individual way to work. Emerging contact forces and emerging temperature were two of the parameters examined in this study. Another one was to find out how long the technicians would need to polish a defined surface area and how the different materials would behave. Finding the right method for the temperature measurement was our problem therefore we decided to make the measurement with infrared to the surface of the probes [1].



Fig. 1: Load cell.

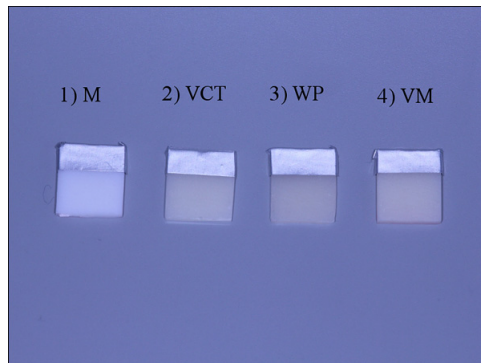


Fig. 2: The four different samples.

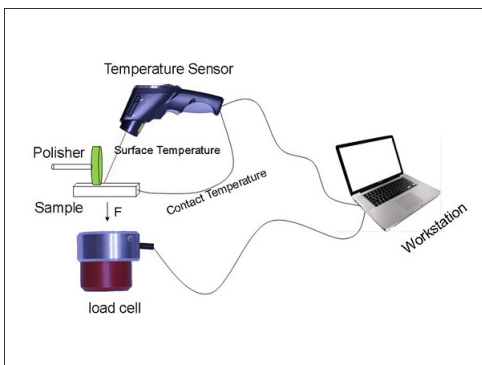


Fig. 3: The measurement setup.

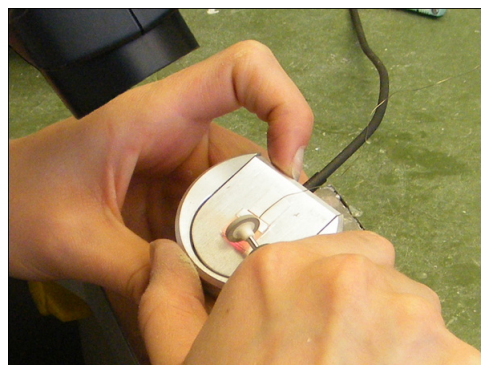


Fig. 4: A dental technician during the polishing proces.

**Material and Methods**

Four different materials were tested. 1) Profix (Merz), 2) CAD Temp (Vita), 3) Zeno CAO temporary PMMA (Wieland Dental & Technik) and 4) Mark II (Vita). Every sample 10x8x2 mm was made out of cerec-blanks (Fig 2.). The plastic interim arrangements were polished with Technik Polisher medium and fine (EVE), the leucite ceramic with Diapol medium and fine (EVE). The contact pressure was measured by a load cell (Lorenz K13); its measurement range is 0.01 N - 10 N, the accuracy is 0.5 N (Fig. 1) The surface temperature in direct nearness to the polishing process was detected by infrared and additionally the warming of the whole sample by direct contact measurement (Testo temp Sensor 845) (Fig. 3).

## Results

In chart 1 and 2 you can see the individual contact force of each technician. You can see this also in chart 3 showing the average contact force over the four different materials. If you oppose this to chart 4 and if you take the mean of the contact forces you will get the average force of 1.15 N (SD 0,68 N).

Chart 5 and 6 show different temperature maxima measured on the sample surfaces. The warming of the samples caused by the polishing process is measured by a thermocouple element. The average warming in chart 7 and 8 was 36,92 °C with a statistical spread of 6,52 °C in chart 7 plus a clear adjustment to the mean in chart 8. This fact is valid for all tested materials The average time used to polish the samples is 46 sec. This was detected after 80 stages.

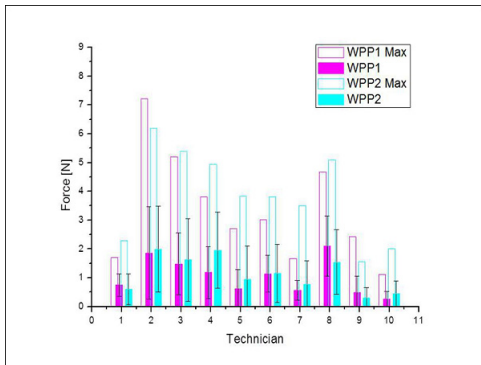


Chart 1 The individual contact forces on the sample Zeno CAO temporary PMMA (Wieland Dental & Technik) of each technician.

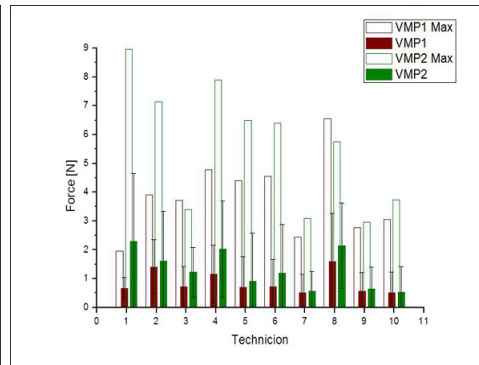


Chart 2 The individual contact forces on the sampel Mark II (Vita) of each technician.

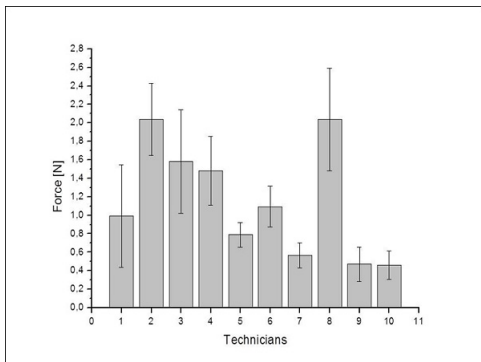


Chart 4 Describes the contact force over all technicians depending on the materials.

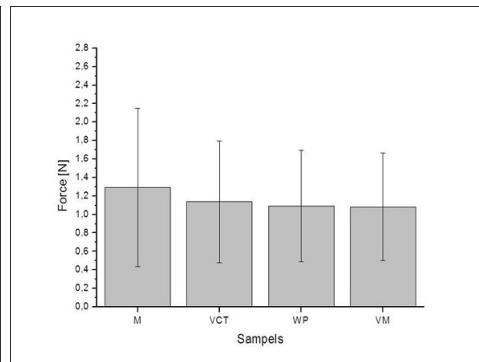


Chart 3 Shows the average contact force of each technician over the four materials.

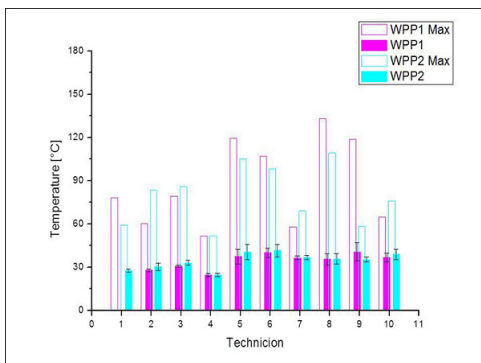


Chart 5 The average temperature on the sample Zeno CAO temporary PMMA (Wieland Dental & Technik) during the polishing process of the technicians.

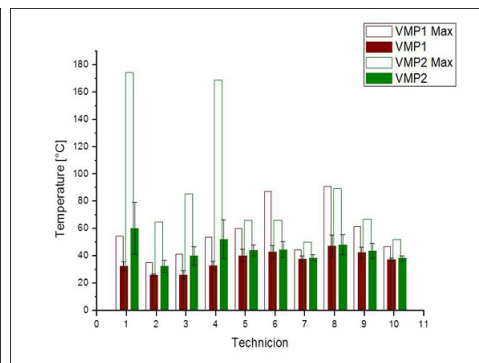


Chart 6 The average temperature on the sampel Mark II (Vita) during the polishing process of the technicians.

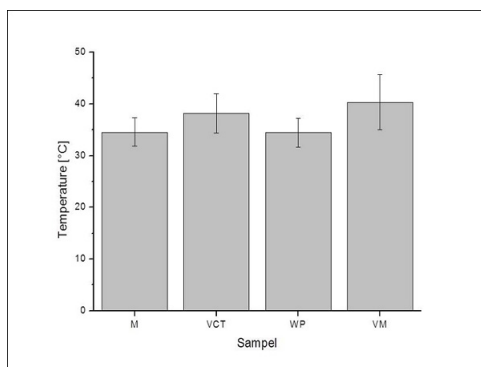
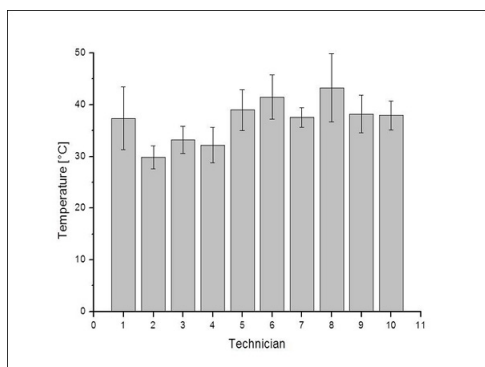


Chart 7 The average warming of the four different materials.

Chart 8 The mean average warming of the four different materials.

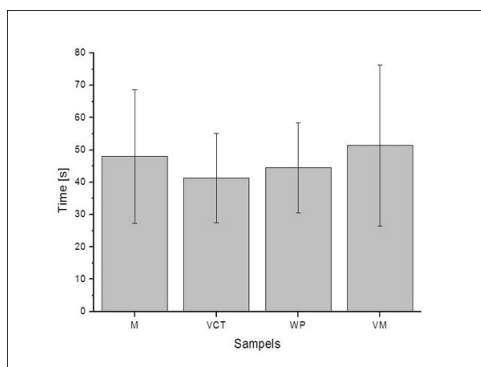
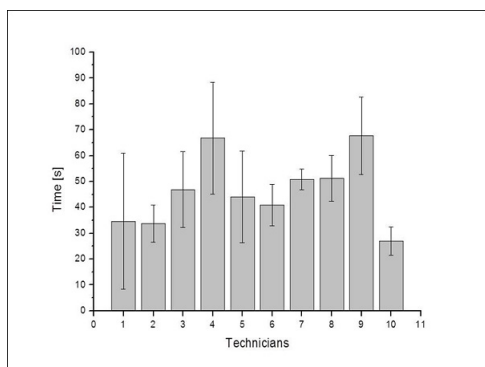


Chart 9 Shows the mean time needed by the technicians.

Chart 10 Shows the mean time the different materials were polished.

## Conclusions

The average contact force was determined and generated by ten dental technicians with 80 sample runs. The average force of 1.15 N which we found out is similar to the forces 1N for a medium polishing wheel and 1.3 N for a fine polishing wheel which was used in the test by Ahmad [2]. The mode of operation for each technician is individual and independent from the qualities of the used materials. Considering the cross check, leucite ceramic Mark II (Vita), you can see that the processing forces have the same average value as the plastic ones. The same goes with the temperature. No material attracts attention deviating from the average. The question which comes into our mind is: why is it that although some of the probates had an obvious higher contact force the temperature did not rise the same way? Is it because of the polishing process duration? But also a longer duration of the process does not mean that the temperature is going higher. There might be some more parameters not described in this poster as a reason for this like the rapidness of the moved polisher since they were not subject in this study.

Summarizing it can be said that:

- The mode of operation for each technician is individual, concerning the contact force and the time used for polishing.
- The measurement cycles with the highest rate of contact force and longest used handling time do not make the highest rate in temperature. Minor contact force and short process time does not guarantee a low warming.
- We can say that all the data produced are close to the arithmetical average.

## Literature

1. Müller WD., Dr. Meyer L., ZTM Unger M: Cooles Zirkonoxid auch bei der Ausarbeitung? Zahntechnik Magazin, 2010,15, S. 275-281.
2. Ahmad R., Morgano S. M., Wu B. M., Giordano R. A.: An evaluation oft he effekts of handpiece speed, abrasive characteristics and polishing load on the flexural strength of polished ceramics, The journal of prosthetic dentistry, 2005, 421-429.

This Poster was submitted by *Harald Zugfil*.

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## Poster Faksimile:

J 106 **Influence of different parameters during polishing:  
a pilot study with 10 dental technicians**

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BioMat

### Introduction

A surface as smooth as possible is unavoidable. Admittedly, the mirror finish during the CAM process is not possible yet. In this way polishing with the aid of a dental hand-piece gets more important than the conventional final firing or the polishing.

### Aim of the study

The aim of this study was to examine different parameters during the dental polishing process by ten different dental technicians concerning their individual way to work. Emerging contact forces and emerging temperature were two of the parameters examined in this study during a polishing process by a dental technician. Another one was to find out how long this technician would need to polish a defined surface area and how the different materials would behave.

### Materials and Methods

Four different materials were tested: 1) Profix (Merz), 2) CAD Temp (Vita), 3) Zeno CAO temporary PMMA (Wieland Dental & Technik) and 4) Mark II (Vita). Every sample 10x8x2 mm was made out of ceramic-blanks (Fig 2). The plastic interim arrangements were polished with Technik Polisher medium and fine (EVE), the leucite ceramic with Diapoi medium and fine (EVE). The contact pressure was measured by a load cell (Lorenz K13); its measurement range is 0.01 N – 10 N, the accuracy is 0.5 N (Fig. 1). The surface temperature in direct nearness to the polishing process was detected by infrared and additionally the warming of the whole sample by direct contact measurement (Testo temp Sensor B45) (Fig. 3).

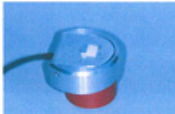


Fig 1

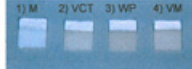


Fig 2

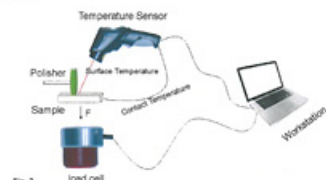


Fig 3

### Results

#### Contact Forces

Zeno CAO temp. (Wieland) | Mark II (Vita) | The average over all materials | The average over all technicians

Chart 1 | Chart 2 | Chart 3 | Chart 4

In chart 1 and 2 you can see the individual contact force of each technician. You can see this also in chart 3 showing the average contact force of the samples. If you oppose this to chart 4 and if you take the mean of the contact forces you will get the average force of 1.15 N (SD 0,68 N).

#### Emerging Temperatur

Chart 5 | Chart 6 | Chart 7 | Chart 8

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#### The Conditioning Time

Chart 9 | Chart 10

The average time used to polish the samples is 46 sec. This was detected after 80 stages.

### Discussion

The average contact force was determined and generated by 10 dental technicians with 80 sample runs. The mode of operation for each technician is individual and independent from the qualities of the used materials. Considering the cross check, leucite ceramic Mark II (Vita), you can see that the processing forces have the same average value as the plastic ones. The same goes with the temperature. No material attracts attention deviating from the average. The question which comes into our minds is: why is it that although some of the probands had an obvious higher contact force the temperature did not rise the same way? Is it because of the polishing process duration? But also a longer duration of the process does not mean that the temperature is going higher. There might be some more parameters not described in this poster as a reason for this like the rapidness of the moved polisher since they were not subject in this study.

### Summary

- The mode of operation for each technician is individual, concerning the contact force and the time used for polishing.
- The measurement cycles with the highest rate of contact force and longest used handling time do not make the highest rate in temperature. Minor contact force and short process time does not guarantee a low warming.
- We can say that all the data produced are close to the arithmetical average.

**Acknowledgement:** Thanks to all the companies which supported this study.

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