Influence of Heat Treatment on Dental Prostheses Produced by Additive Technology

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Aim of study

Geometry comparison of dental prosthesis manufactured via SLM technology after:

- direct removal from the build platform

- heat treatment

Design and material

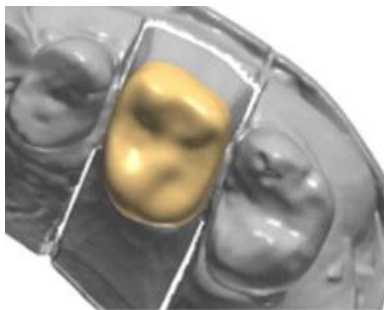- 3Shape D700 dental scanner

- 3Shape CAD software

- Crown
- Two-unit bridges
- Three-unit bridges

Starbond Easy Powder 30 (Scheftner, Germany)
Co 61%, Cr 27.05%, W 8.5%, Si 1.6% and other elements (C, Fe, Mn) <0.1%.
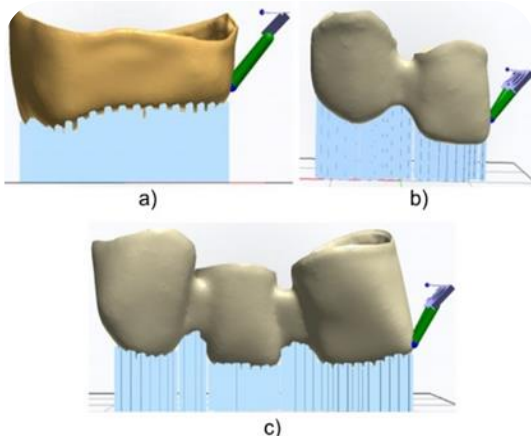

a)   b)   c)
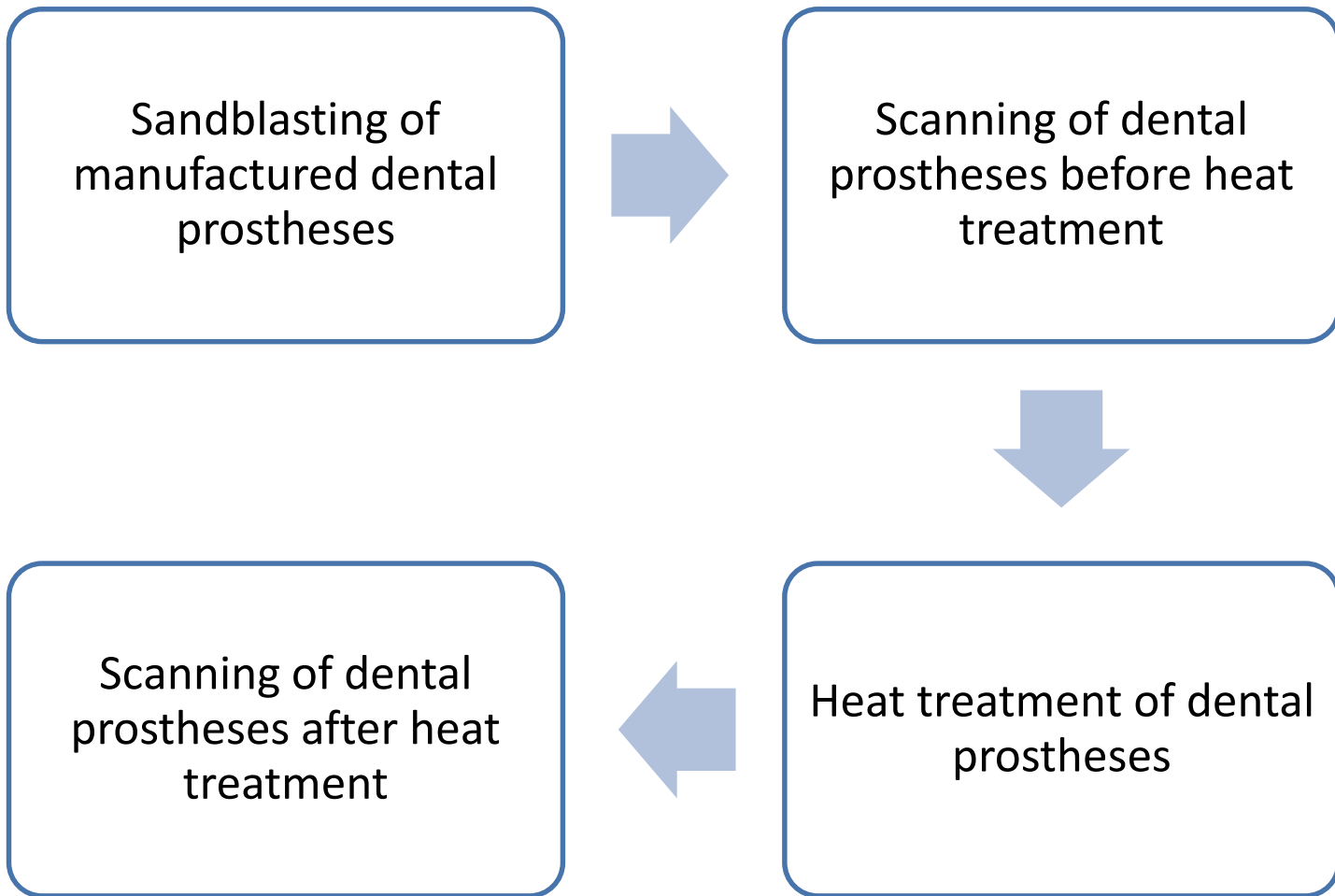
Production of dental prosthesis

CAMbridge software
(3Shape, Denmark)

Mlab cusing R
(Concept Laser, USA)

10 pc. crowns
10 pc. two-unit bridges
10 pc. three-unit bridges

Postprocessing of 3DP dental prosthesis

Sandblasting of manufactured dental prostheses

Scanning of dental prostheses before heat treatment

Heat treatment of dental prostheses

Scanning of dental prostheses after heat treatment

Scanning process and heat treatment

3Shape D700
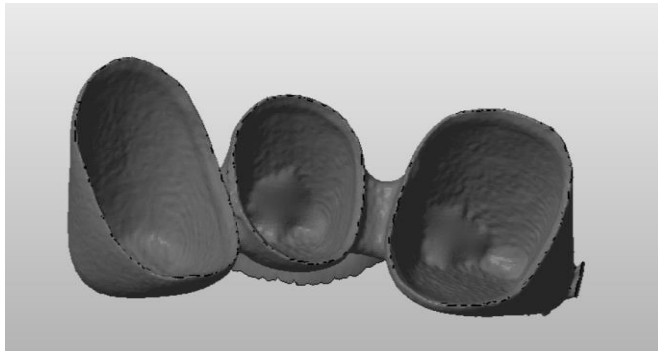
inFire HTC speed sintering furnace (Sirona, USA)

Argon atmosphere

650 °C | 65 °C/min

980 °C | 55 °C/min for 10 min

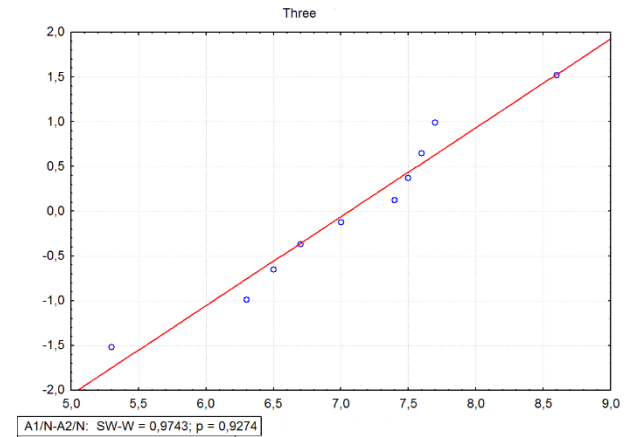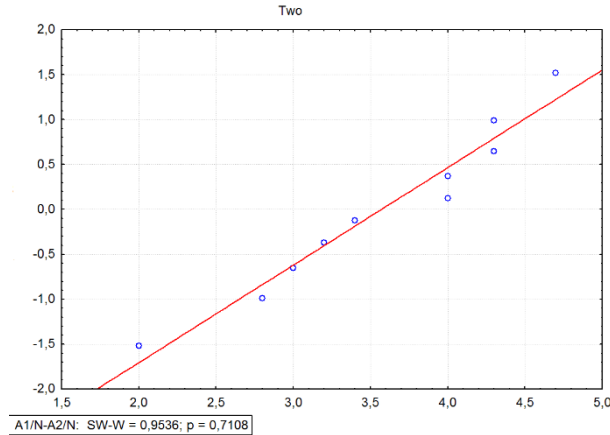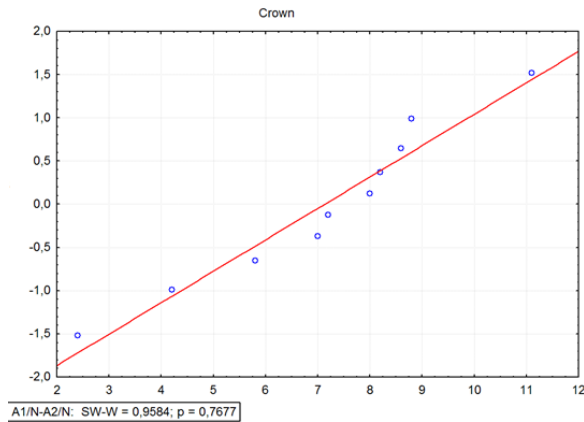970 °C | Gradual cooling
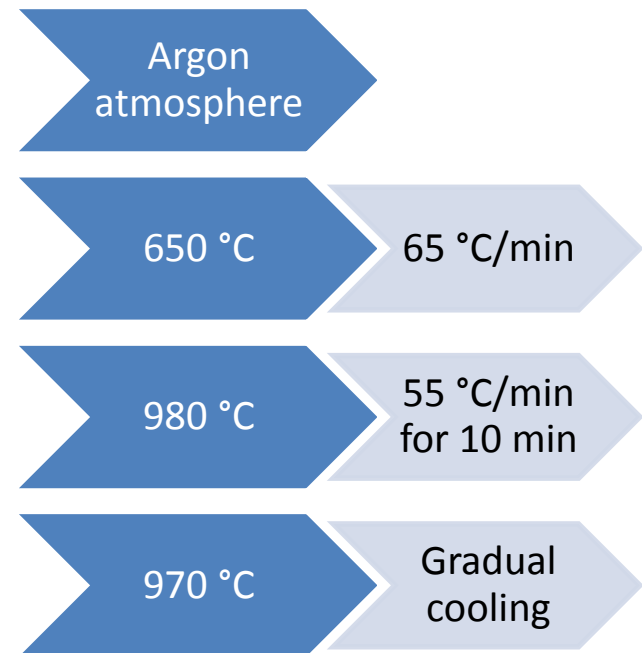
Evaluation methodology

GOM Inspect software:

1. Dental models in .stl vs. scanned models without treatment – N/A1,

2. Dental models in .stl vs. scanned models after heat treatment – N/A2

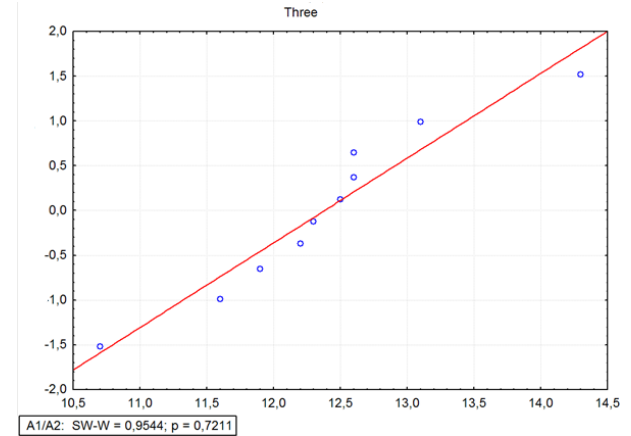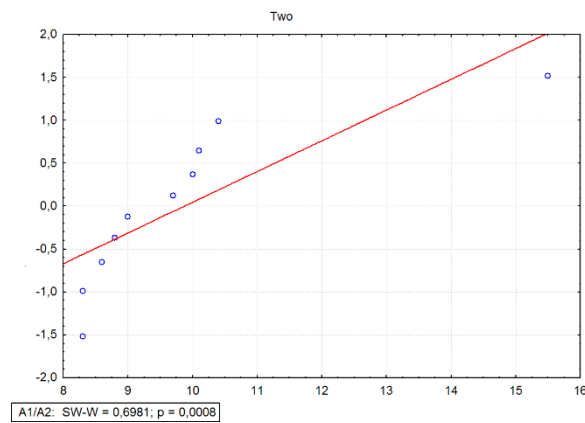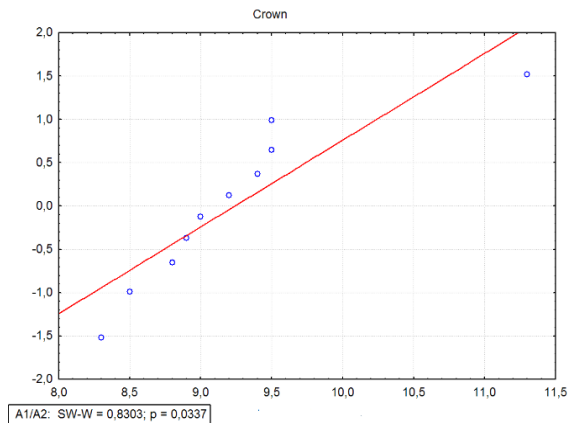3. Scanned models without heat treatment vs. Scanned models after heat treatment – A1/A2
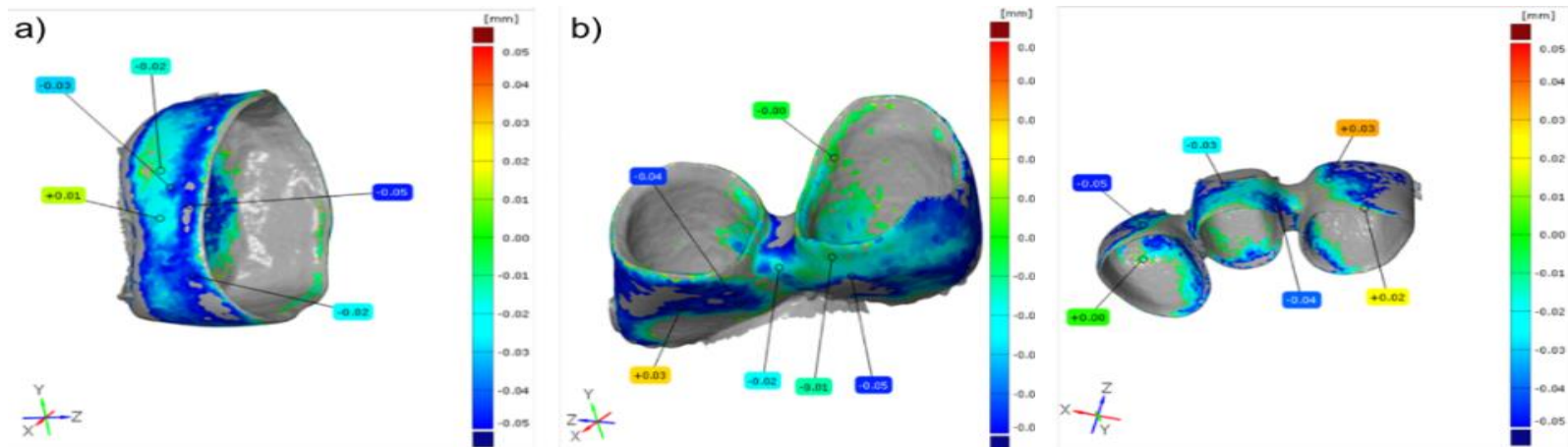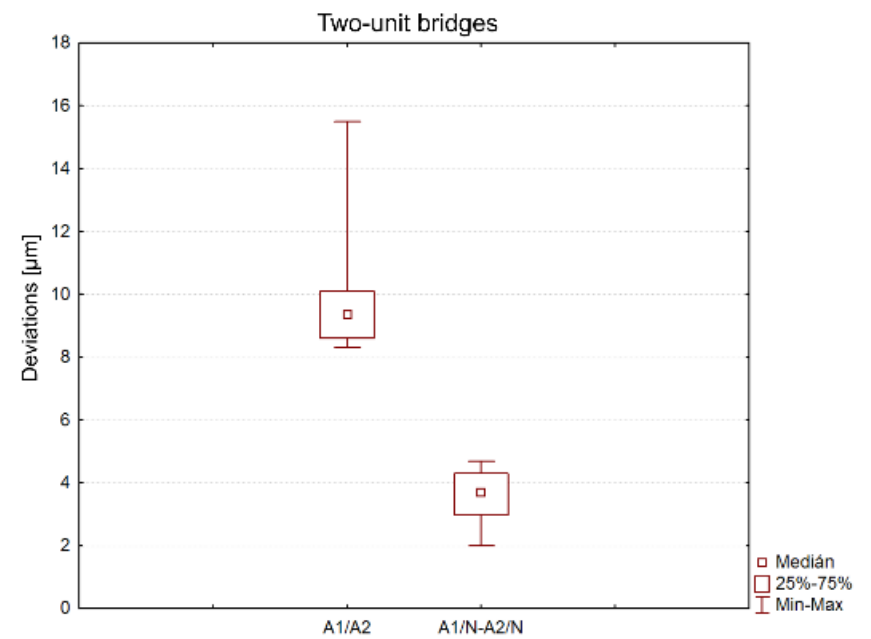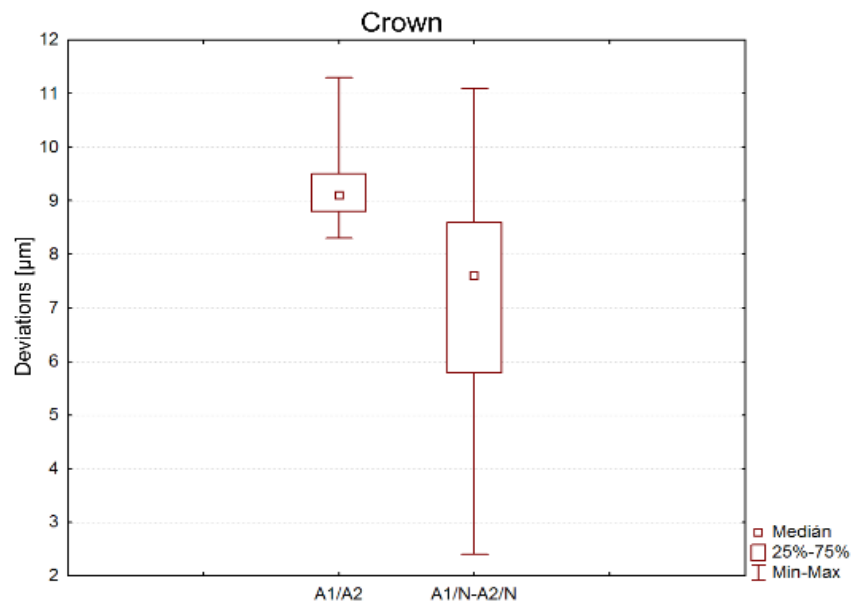
Results

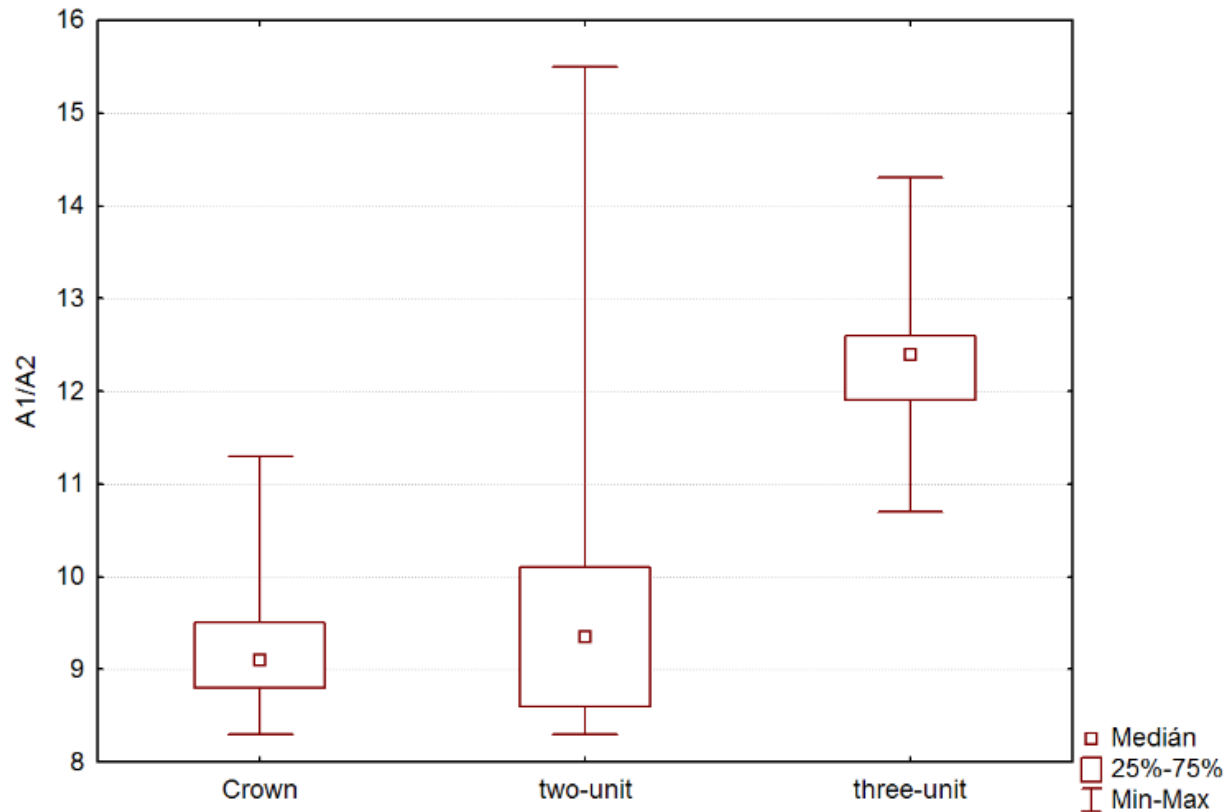Shapiro-Wilk test of normality

Probability p plot

Results

Results

Conclusion

- Pilot study of heat treatment influence on dental prosthesis

- The heat treatment method may also differ depending on the type of used metallic powder, its particle size, used machine and parameter settings during SLM

- Thank you for your attention!

THANK YOU FOR YOUR ATTENTION