



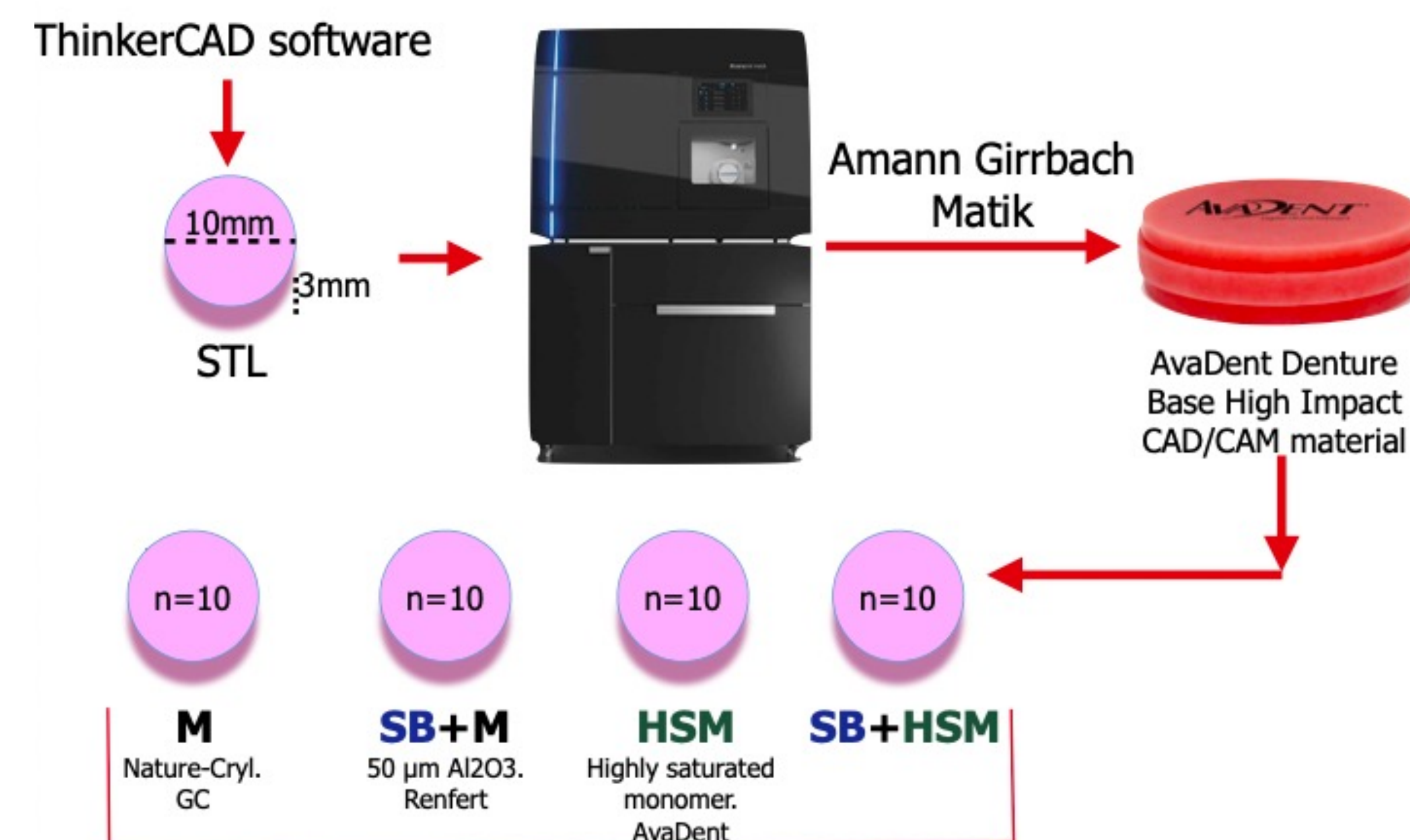
## Introduction / Background

Although CAD-CAM milled dentures and teeth appear to have better flexural strength and hardness than heat-polymerized and 3D-printed PMMA resins, fatigue and impacts can result in their fracture [1]. The repair strength of CAD/CAM materials is lower than that of conventional materials because of the minimal number of free monomers and minimal porosity, resulting in fewer chemical bonds than conventional materials [2]. Different surface modifications are applied on CAD-CAM milled denture and teeth prior to repair fractures including, sandblasting, 4% hydro fluoric acid, tungsten carbide bur, dichloromethane + methyl methacrylate mixture, and dichloromethane + methyl methacrylate [3]. There is no consensus about the best method to repair milled dentures or teeth and how different surface treatments can affect their roughness and wettability, which are essential factors that could posteriorly explain the mechanism of repair strength.

## Objective

The aim of this in-vitro study was to evaluate the impact of surface modification on the roughness and wettability of CAD/CAM milled denture bases.

## Materials and Methods



Surface roughness.  
VK-500 Confocal Laser  
Scanning Microscope.  
Sa and Sz (in  
micrometers)

Wettability. Ossila goniometer.  
1-microliter of Nature-Cryl  
monomer or Highly Saturated  
monomer onto the surface of the  
disks, in accordance with their  
treatment groups. The contact  
angle per sample ( $\theta$ ) was  
determined automatically using  
the Ossila software.

## Results

The surface roughness was higher for the P+S+M and P+S+HSM disks ( $R_z 8.133 \pm 1.413 \mu m$ ) compared to the P+M and P+HSM disks ( $R_z 1.1 \pm 0.19 \mu m$ ) ( $p < 0.05$ ). (Figure. 1 and Figure. 2).

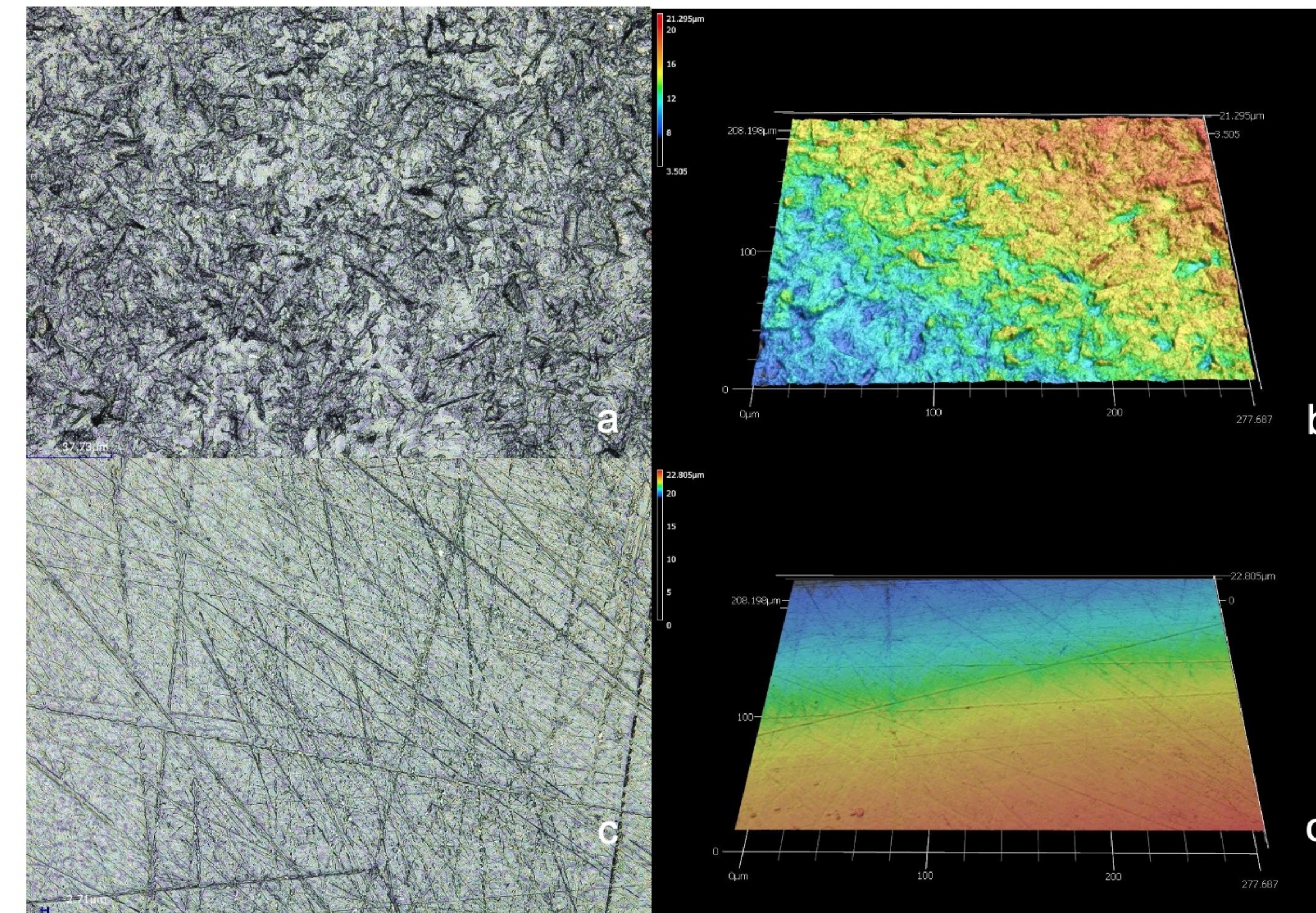


Figure 1. a) Sandblasted, b) Sandblasted 3D, c) Polished, d) Polished 3D.

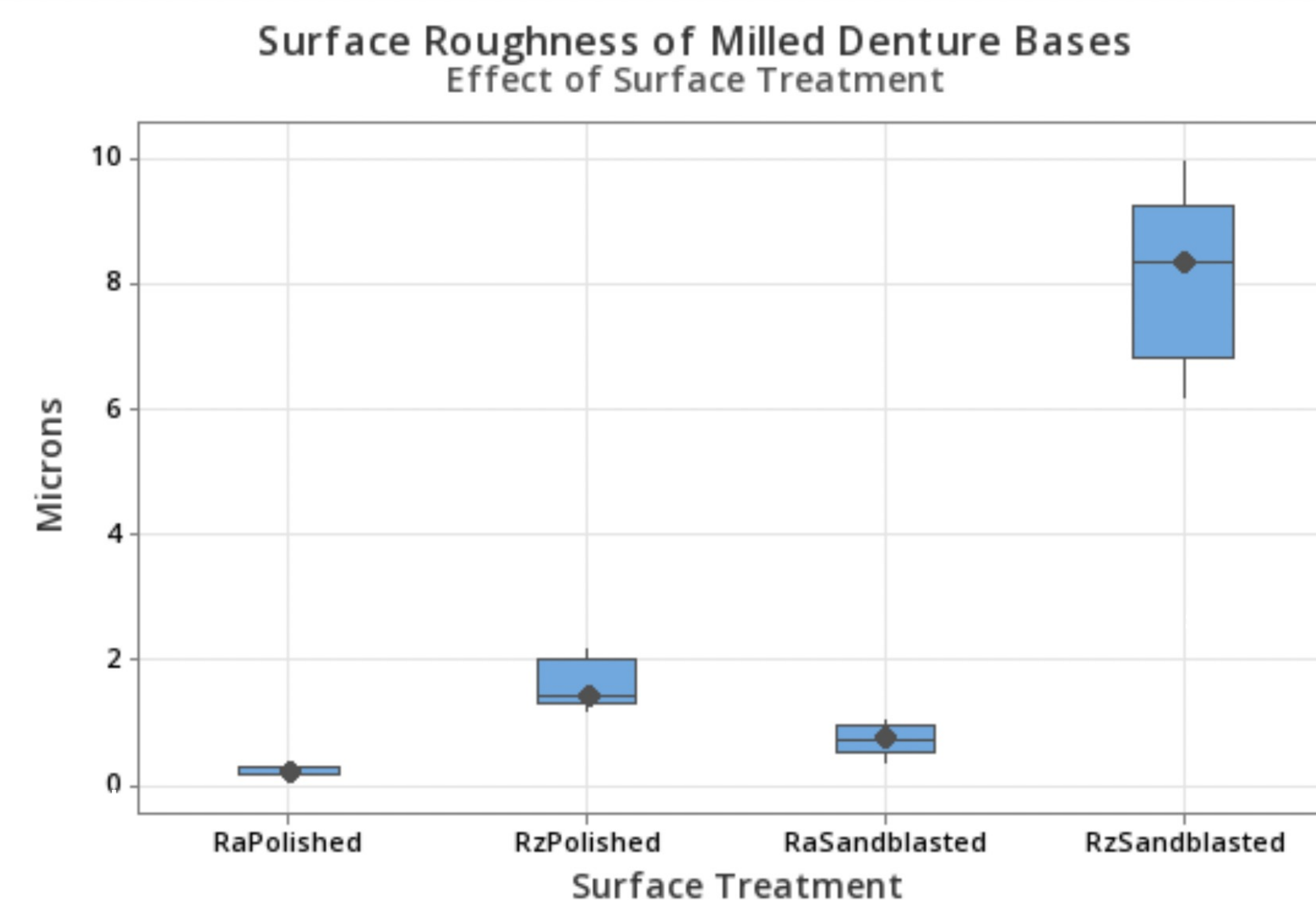


Figure 2. Boxplot of the surface roughness produced by different surface treatments on CAD/CAM denture base disks.

All the disks were hydrophilic. The hydrophilicity was slightly higher for the polished P+M ( $\theta 8.52$ ) and P+HSM ( $\theta 9.337$ ) disks compared to the sandblasted P+S+M ( $\theta 11.50$ ) and P+S+HSM ( $\theta 12.65$ ) disks. However, no statistical difference was present in the multiple comparisons. ( $p > 0.05$ ). (Figure. 3).

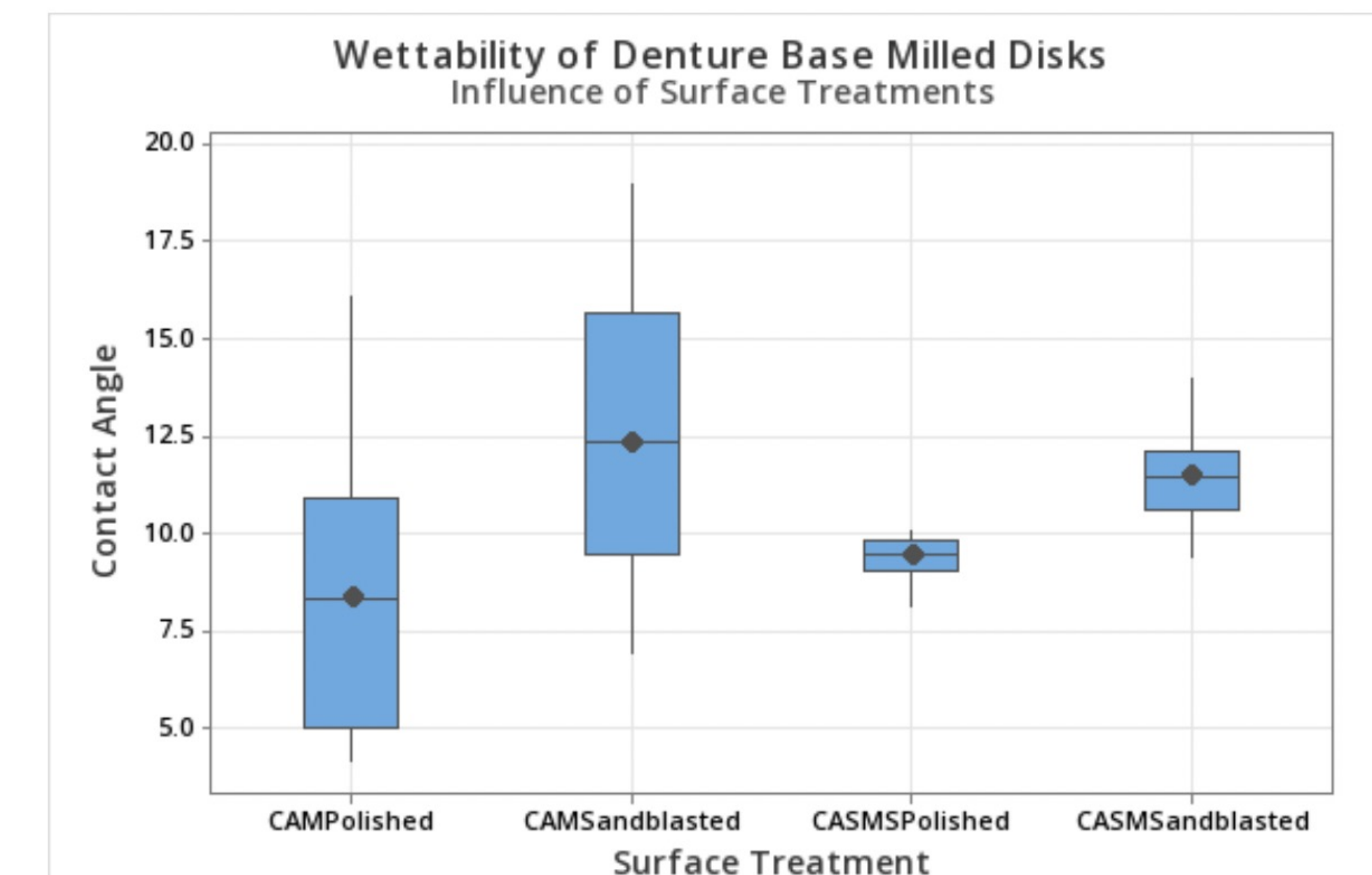


Figure 3. Boxplot of the wettability produced by different surface treatments of CAD/CAM denture base disks.

## Conclusions / Summary

- Within the limitations of this experimental study it can be concluded that the surface treatment affects the roughness and wettability of CAD-CAM milled denture base materials. The sandblasting method creates a rougher and less hydrophilic surface than monomer-treated disks.
- The conventional monomer and the highly saturated monomer offered comparable wettability.

## References

- El Samahy MM, Abdelhamid AM, El Shabrawy SM, Hanno KI. Evaluation of physicomachanical properties of milled versus 3D-printed denture base resins: A comparative in vitro study. J Prosthet Dent. 2023;129:797.e1-797.e7.
- Choi JJE, Uy CE, Plaksina P, Ramani RS, Ganjigatti R, Waddell JN. Bond Strength of Denture Teeth to Heat-Cured, CAD/CAM and 3D Printed Denture Acrylics. J Prosthodont. 2020;29:415-421.
- Erbulak Z, Ergun G. The effects of different surface treatments applied to milled PMMA denture base material on repair bond strength. Odontology. 2023;111:953-970.