

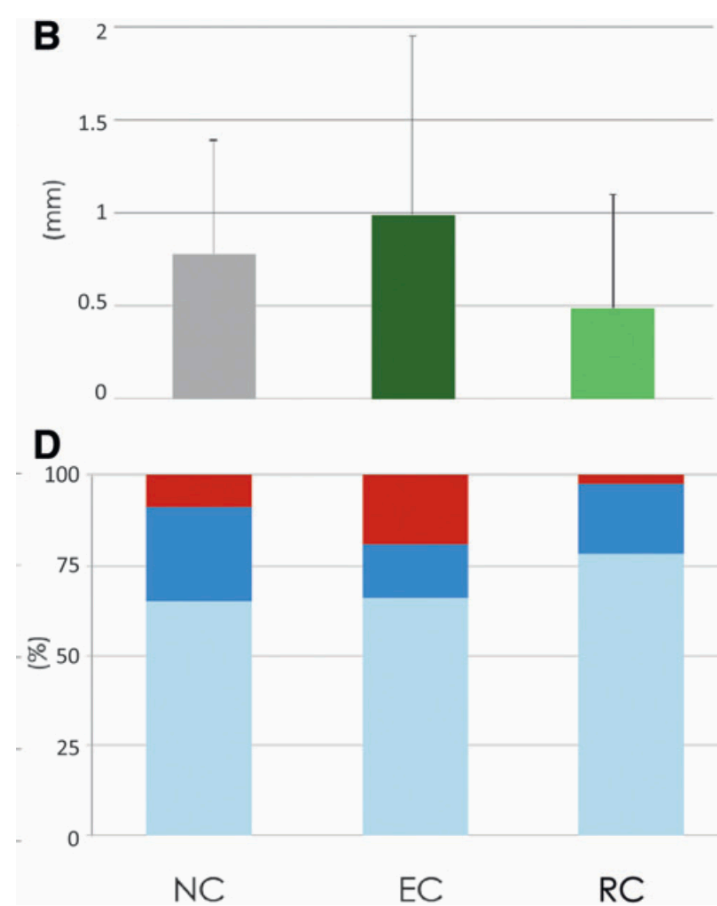
In-Vitro Comparison of Polished Implant Abutment Surface Roughness and Bacterial Adhesion after Instrumentation with Polyether-Ether Ketone (PEEK) Ultrasonic Instruments

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Introduction:



RC (Regular Compliance)
3 to 6-month recall interval (>2 PIMT/year)

EC (Erratic Compliance)
7 to 12-month recall interval (<2 PIMT/year)

NC (Non-Compliance)
no recall interval program (no PIMT/year)

● Peri-implantitis
● Mucositis
● Healthy

Monje, A., Wang, H. L., & Nart, J. (2017). Association of preventive maintenance therapy compliance and peri-implant diseases: a cross-sectional study. Journal of periodontology, 88(10), 1030- 1041.

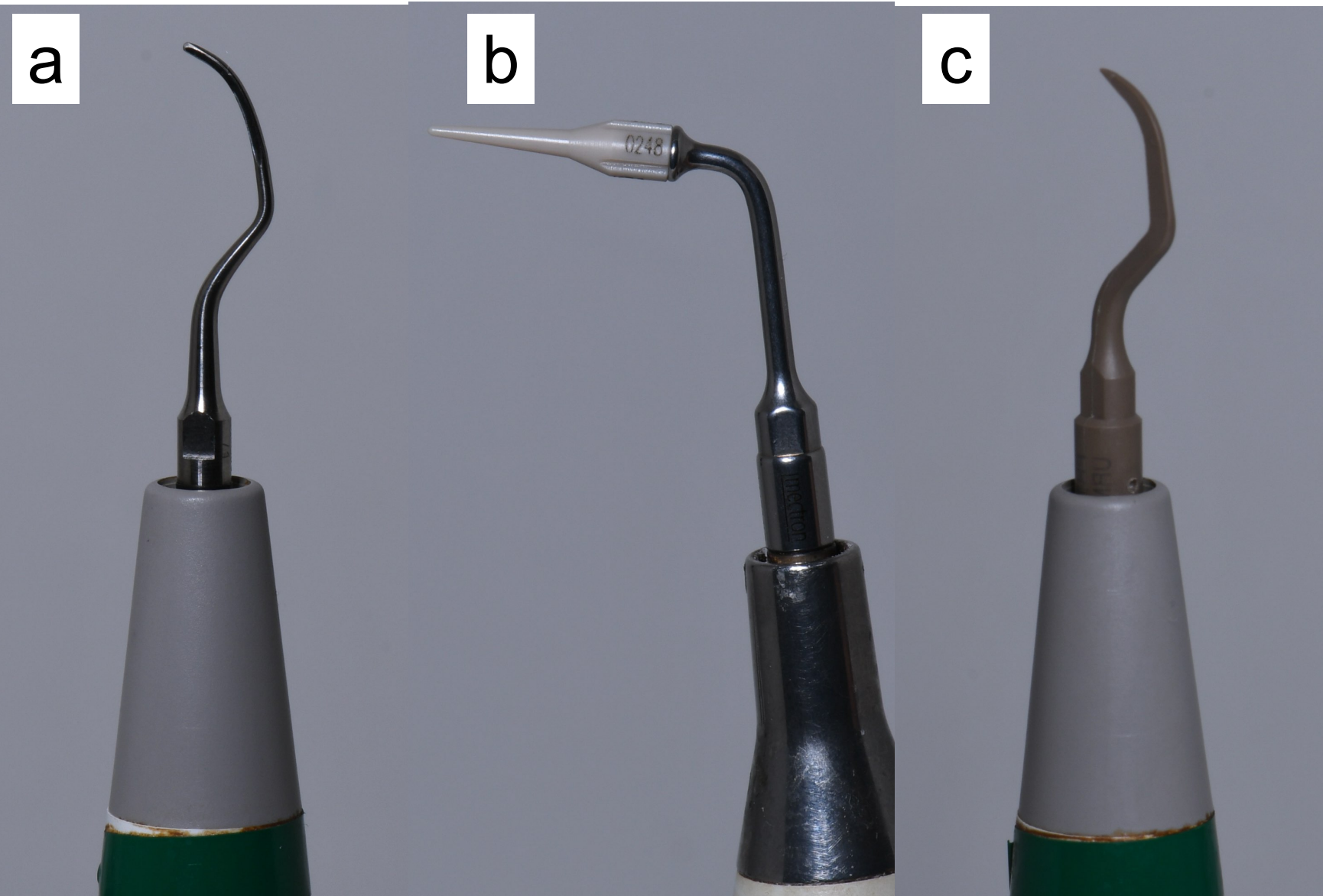
- No standardized protocols: technique depends on clinician's assessment of benefits & disadvantages of each method.
- Powered instruments offer additional benefit of electrically-generated cavitation effect that aids in biofilm disruption.
- Harder materials (steel, carbon, titanium) can produce surface irregularities.
- Softer materials (plastic) found to be ineffective in biofilm disruption and debridement.

Purpose: To compare the surface roughness changes and the bacterial colonization of polished titanium after instrumentation with a piezoelectric device with commercially available PEEK attachment tips, conventional titanium attachment tips, and plastic attachment tip.

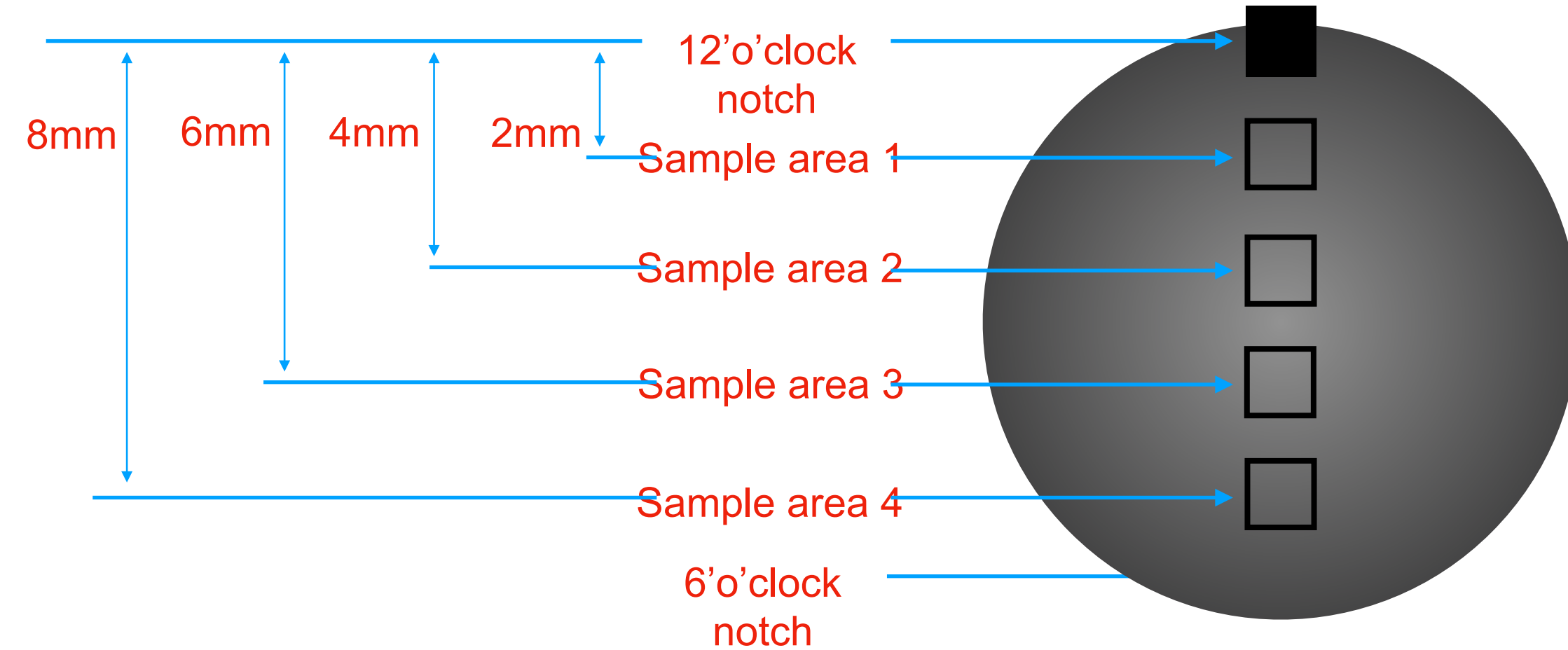
Materials and Methods:

Groups:

1. No instrumentation will be performed
2. Curette-shaped titanium Universal Implant Protect piezo instrument tip (a) (IP1: Acteon Satelec SP Newtron. Mount Laurel, NJ, USA)
3. Straight, round PEEK-coated Implant Cleaning Insert piezo instrument tip (b) (IC1: Xpedent. West Sussex, England)
4. Plastic anterior curette-shaped Periosoft piezo instrument tip (C) (PH1: Acteon Satelec SP Newtron. Mount Laurel, NJ, USA)



Subjects: Grade 23 pure titanium discs (n=40)



Surface roughness was measured prior to and post-instrumentation using mean Ra and Rz values via optical profilometer (Proscan 2000, Scantron, Venture Way, Tauton, UK; S5/03 sensor, 0.3 mm measuring range)

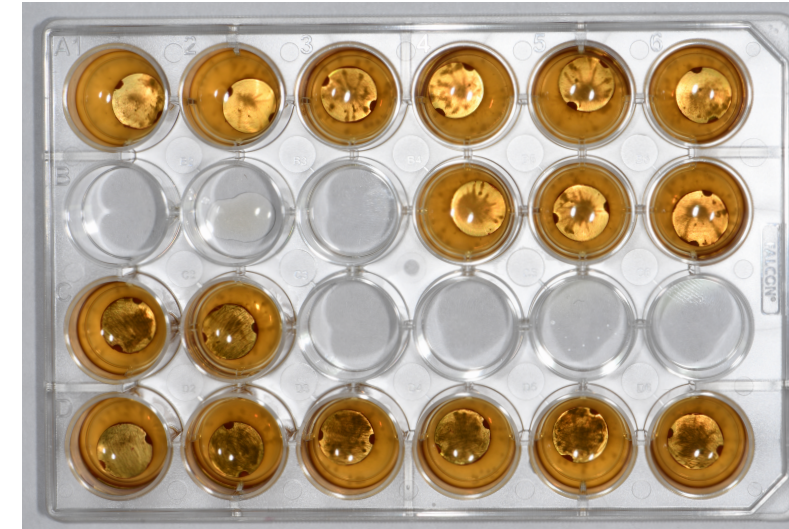
Instrumentation:

All instrumentation protocols with the piezoelectric device followed the manufacturers' instructions; with 30% power for 1 minute with copious water irrigation.



Microbiological analysis:

- *S. sanguinis* incubated for 24 hrs and serial dilutions performed
- Each disc placed into a single well of 24-well plate and 1mL of BHI-S added to each well.
- 50uL of either 1:1000 or 1:10,000 *S. sanguinis* placed into each well.
- Wells incubated for 24 hours
- 100uL of each bacterial sample pipetted onto each plate in duplicate and glass plater utilized to spread the bacteria.
- 128 plates total
- Plates incubated for 24hrs for CFU counts



SEM Analysis:

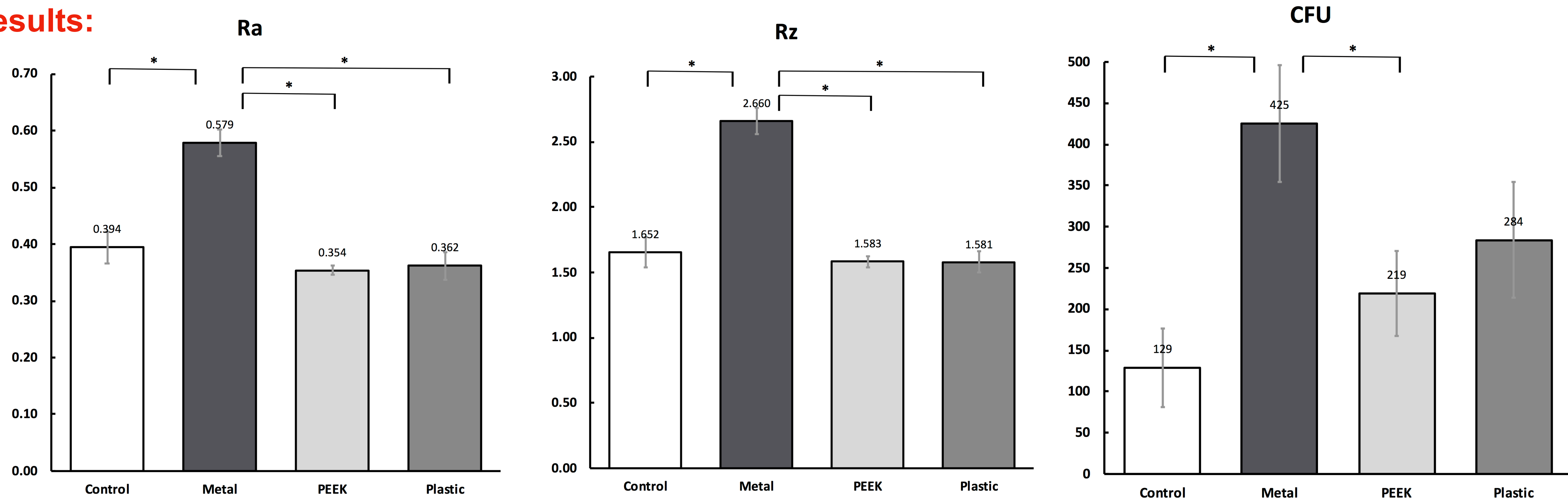
Single specimen from each group was selected after instrumentation to visualize the surface roughness. The samples were evaluated under a SEM (JOEL 7800f FESEM, Japan), operating at x500, x1000, x2000, and x10000 magnifications.



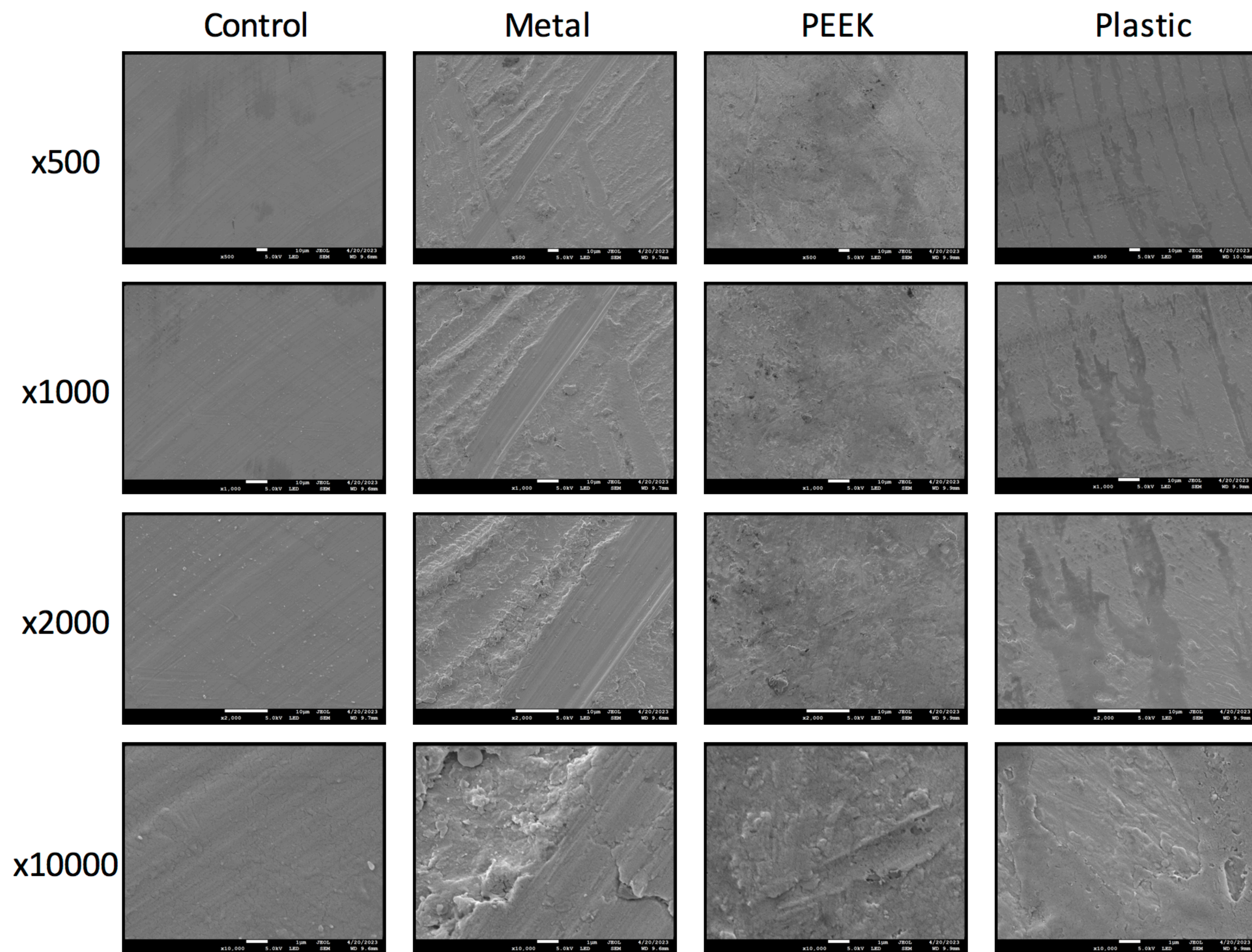
Statistics: Surface roughness (R_a and R_z) pre-instrumentation and post-instrumentation and roughness change and bacteria colony counts were compared using one-way Analysis of variance (ANOVA) followed by pair-wise group comparisons using Fisher's Protected Least Significant Differences.

A Spearman correlation coefficient between the post-treatment surface roughness and bacteria CFU was calculated. A 5% significance level will be used for all tests and all analyses were performed using SAS version 9.4 (SAS Institute, Inc., Cary, NC, USA).

Results:



Results:



Conclusion:

Instrumentation of machined titanium surfaces with PEEK or plastic piezoelectric tips did not significantly change the surface roughness or bacterial colonization of said surfaces. Meanwhile, instrumentation with a metal ultrasonic tip significantly raises the surface roughness and bacterial colonization of machined titanium. It can be concluded that the use of PEEK piezoelectrically-driven tips for maintenance of machined titanium surfaces does not alter the surface topography and does not result in higher bacterial colonization.

Acknowledgement

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