

In vitro study on the proliferation and differentiation of human mesenchymal stem cells on modified titanium surfaces.

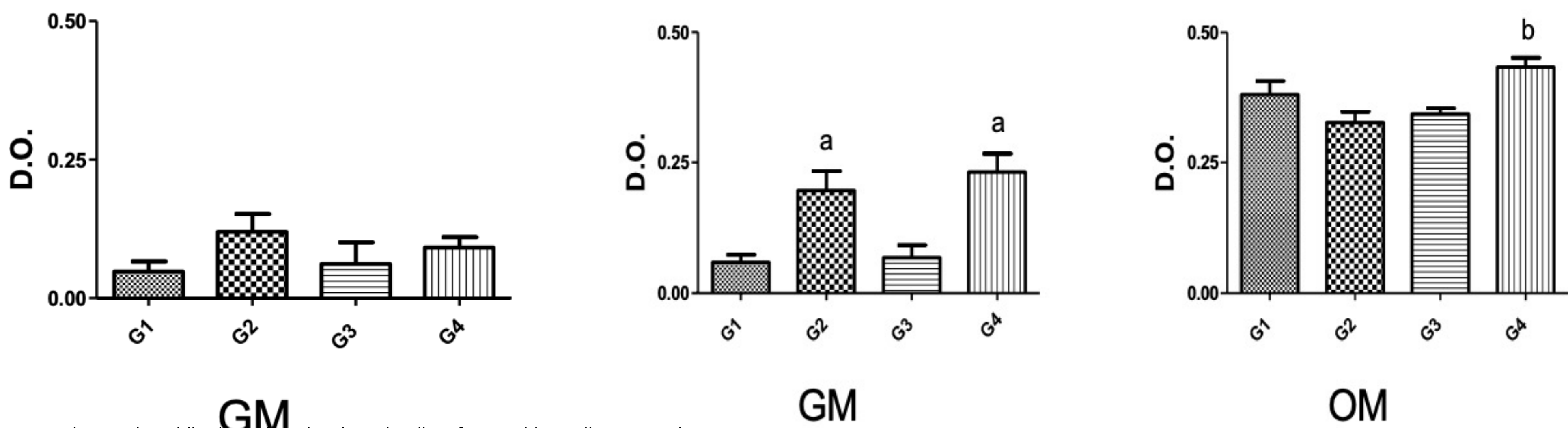
Saturnino Marco Lupi¹, Martina Ghizzoni¹, Claudia Todaro¹, Laura Caliozna², Micaela Berni²
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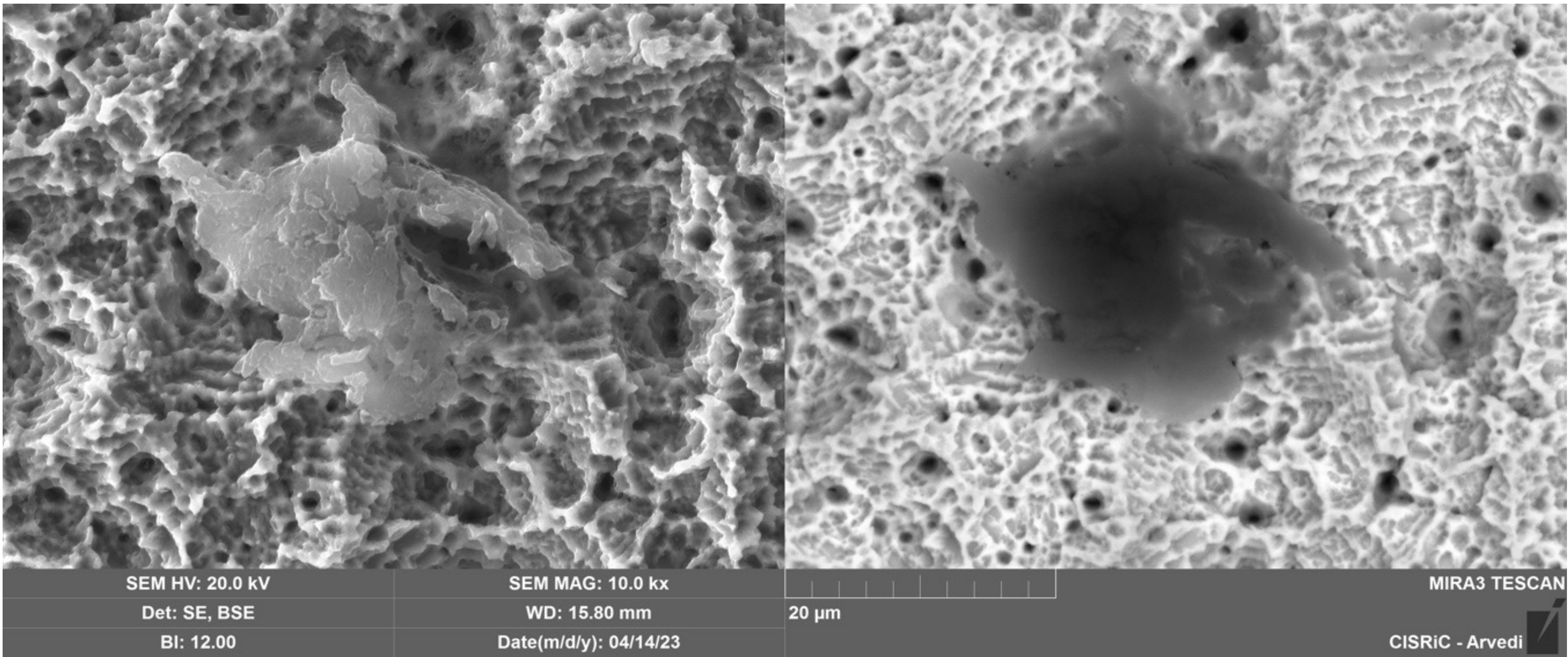
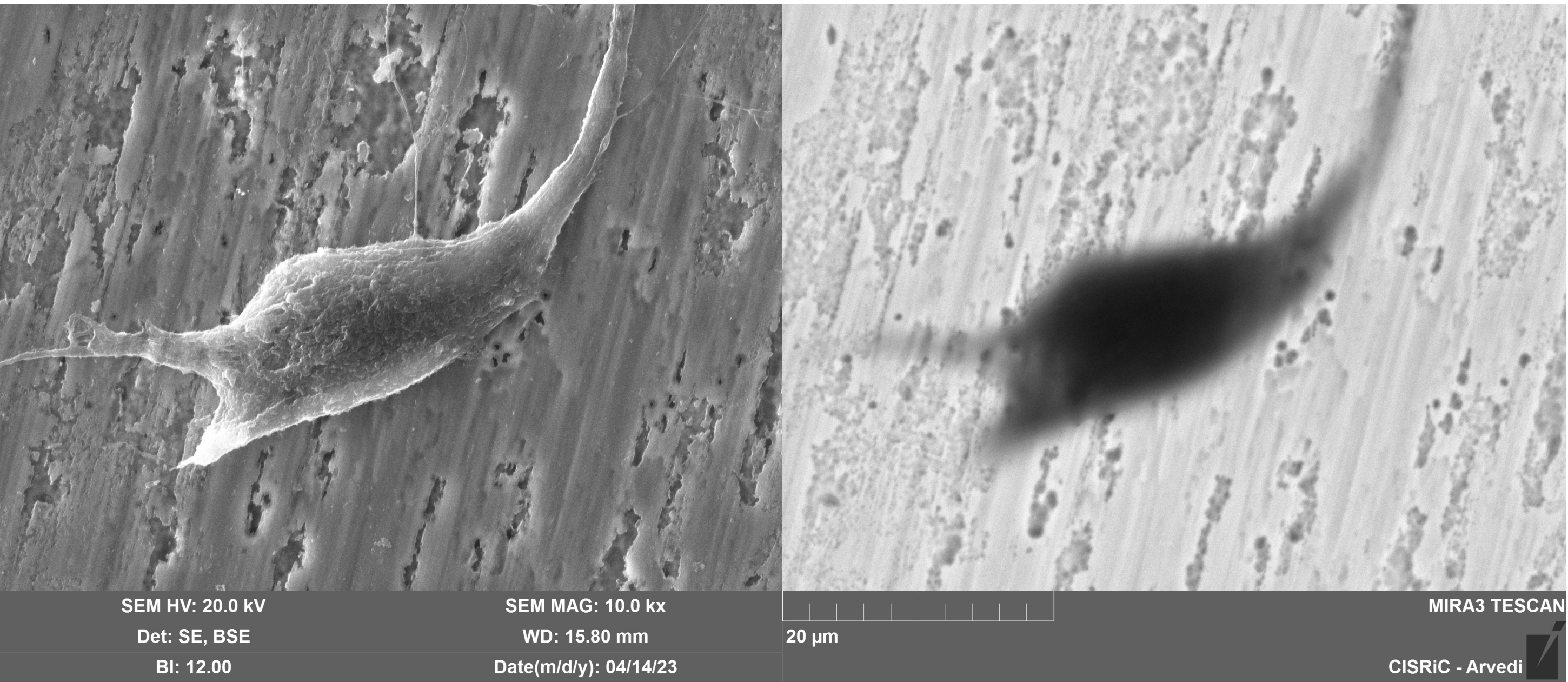
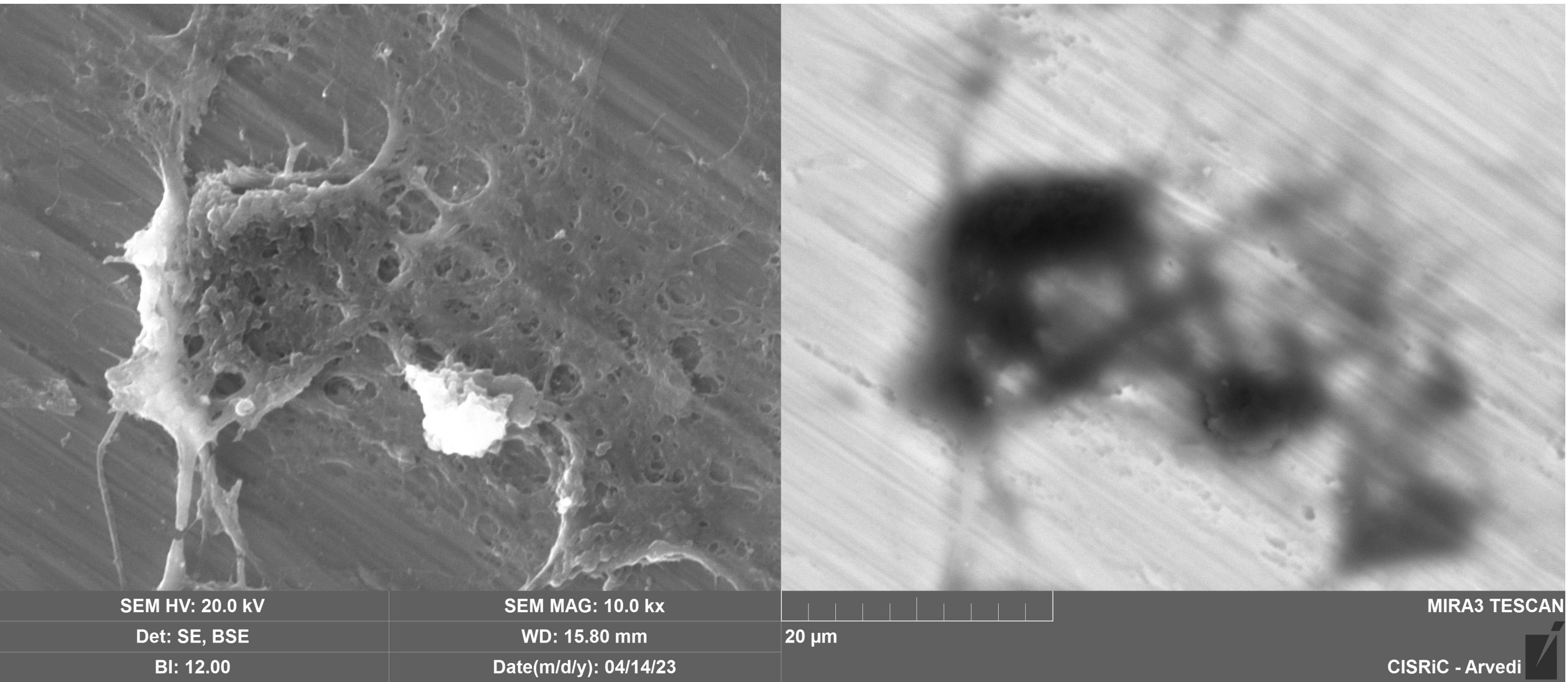
Introduction and Objectives: Titanium is commonly employed in dental implants due to its biocompatibility and osteointegration properties. It is well-established that the surface structure of an implant plays a crucial role in bone tissue interaction. Previous research has indicated that micro/nano rough surfaces facilitate a more effective osseointegration process compared to smoother surfaces. This study aims to assess the initial cellular response of mesenchymal stem cells during the osseointegration process, focusing on proliferation and differentiation events related to titanium scaffolds with various surface treatments.

Materials and Methods: We conducted cellular vitality assays (WST-1), assessed alkaline phosphatase (ALP) activity, normalized ALP concentrations using a protein assay, and performed scanning electron microscopy (SEM) analysis.

Conclusion: These findings indicate that the surface properties of titanium scaffolds can influence early-stage cell growth and differentiation in the osseointegration process. Specifically, anodized SLA surfaces were shown to promote both of these processes. Studies of this nature hold the potential to advance our comprehension and enhancement of the osseointegration process. Nonetheless, further investigations, both in vitro and in clinical settings, are warranted.



Results: Both WST-1 and ALP activity assays confirmed that SLA and anodized titanium surfaces enhance proliferation and differentiation of human mesenchymal stem cells compared to machined (both machined and anodized) surfaces. Additionally, SEM analyses revealed that cells cultured on machined surfaces exhibited a smooth, planar phenotype, while those on micro-rough surfaces displayed an epithelioid morphology with numerous cytoplasmic extensions interacting with the scaffold.



¹ School of Dentistry, Department of Clinical Surgical, Diagnostic and Pediatric Sciences, University of Pavia, Pavia, Italy.
² Orthopedics and Traumatology Clinic, IRCCS Policlinico San Matteo Foundation, 27100 Pavia, Italy



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