An Investigation of the Effect of Surface Characterization on Saos-2 Cell Proliferation After Coating of Titanium Alloy Surfaces with Selective Laser Melting Process

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Abstract

Nowadays, titanium and its alloys are the most common materials used in dental implants. Lathed-titanium implant surfaces are processed in various ways to produce the best bone-implant structure. Researches on shortening the duration of osseointegration of dental implants are gaining importance nowadays. For this reason this study will analyze the proliferation of Saos-2 cells after Grade 5 lathed-titanium disks are covered with titanium Grade 23 through the SLM process, in attempts to promote biocompatibility and surface features of implants.

Figure 1: Sample groups of titanium discs

Results

Surface topography has an effect on cell proliferation, and osteoblast cells cultured on rough surfaces tend to have more differentiated osteoblast properties than cells cultured on smoother surfaces.

Figure 2: SLA + Laser groups AFM and SEM images

Figure 3: Alkaline phosphatase activity values of Saos-2 cells on day 3

Background and Aim

The aim of our study is to evaluate the proliferation of bone-derived human osteoblast-like human Saos-2 cells on a rough surface formed after coating of Grade 5 turned-titanium material (Ti-6Al-4V) alloy with Grade 23 titanium alloy using SLM method.

Conclusion

- 1) Corrosion resistance and cell adhesion were found to be increased in line with the thickness of TiO₂ layer on the titanium surfaces of Grade 23.
- 2) SLA has good wettability due to rough and uneven surfaces. As the surface roughness increases to a certain amount, the biological behavior of osteoblasts is positively affected and the cell connection increases.

Methods and Materials

In this study, 48 grade 5 titanium discs having 6 mm diameter and 2 mm thickness was prepared. The surface of half of the discs is coated with grade 23. In the 1st group, no surface treatment was applied to the surfaces of the discs. Only the selective laser melting was applied to the discs in the second group. The SLA procedure was performed in accordance with the ASTM criteria for 3rd group. Group 4 received SLA procedure after selective laser melting.

References

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