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Synthesis of TiO_2 nanotubes over Ti6Al4V surface to improve osteocompatibility of bone implants

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Statement of the Problem: Rapid growth has been witnessed in the field of implant fabrication, in the last decade. Titanium alloys are among the most used metallic biomaterials, particularly for orthopedic applications, as they have low specific weight, excellent mechanical properties, immense resistance to corrosion in biological fluids, good wear resistance and very low toxicity towards the host. Further, to improve bone fixation and enhance the biocompatibility of the titanium based implants, bone cements are used in conjugation with the implant materials during the joint replacement surgeries. However, such implants fail due to de-bonding of cementing material followed by accumulation of the particulate causing toxicity and cell death. Also, bone loosening might occur at the cement-prosthesis interface and/or cement-bone interface, thereby increasing the chances of implant failure by two-folds. To address this limitation, surface modification of Titanium implants has been considered to enhance the biocompatibility of the substrate.

Methodology & Theoretical Orientation: In the present study the surface of Ti6Al4V was modified through the synthesis of TiO_2 nanotubes using anodic oxidation. The nanostructured surface was expected to enhance the surface area for cellular interaction and increase osteoconductive property of the implant without the release of toxic particles from coating material.

Findings: TiO_2 nanotubes were synthesized and characterized for its morphology, surface roughness, wettability and osteo-compatibility.

Conclusion & Significance: It was observed from the study that the nanostructured surface significantly enhanced the osteoconductive property and biocompatibility of the Ti6Al4V implant surface.

Biography

Sahely Saha is Research Scholar at the Department of Biotechnology and Medical Engineering, National Institute of Technology in India under the supervision of Dr. Amit Biswas. Her current area of research includes biomaterials and tissue engineering. Previously, she has completed her Master's degree in Biotechnology and carried out a study based on bio-beneficiation of bauxite ore, as a part of her final year research work.

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