Metallic Biomaterials and Their Importance to Medical Applications

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Biomaterials offer the surgeon a powerful set of clinical tools for patient treatment and are found in virtually every instrument, device, implant, or piece of equipment in the operating room. Material science has been described as part of a health care system that will be driven by clinical need, with the ultimate goal of being able to restore or replace function in part of a failed organism through the use of biomaterial science. A significant numbers of materials including metals, ceramic, polymers, composites and some nanomaterials exist and are used in medicine for current and potential applications like orthopaedic prosthesis, cardiovascular applications, dental implants, bone substitutes, cements, and many other clinical applications. Actually, the medical devices and tissue engineering product development support various surgical specialization in medicine.

This paper focuses on some newly developed potential biomaterials as well as the novel technologies used for biomaterials processing and characterization. These aspects have a significant influence on the evolution of modern medicine. New trends in metallic biomaterials, surface modification, and characterization techniques will be reviewed and discussed with particular reference to their relevance in biomaterials-tissue interactions phenomena. Experimental results performed on different new metallic biomaterials like biodegradable metals will be shown. Current knowledge of biomaterials focusing on design and surface help us to understand which implant surfaces have more predictable clinical outcomes. Because the advanced microscopically techniques such as scanning electron microscopy and atomic force microscopy are used now to determine the interfacial structure/ property/biofunctionality relationships of synthetic biomaterials with human tissues, different practical examination of some relevant biomaterials will be presented in order to show the advantage given by this techniques. The clinicians at the interface of biomaterial applications and patient care have the ability to drive that development and innovation, taking a critical view of the currently available medical devices and defining future needs in clinical practice.

In conclusion, future research and studies on some promising biomaterials are essential in terms of biocompatibility, structure and properties in order to make them clinically viable. Interdisciplinary research between engineers and clinicians appear to be mandatory in order to be sure that new proposed biomaterials and technologies will be applied in practice. Advancements will result from interdisciplinary research that require the combination of fields and the collaboration of experts in engineering, biology and clinicians from different specialities with the ultimate goal of manipulating and maintaining the biofunctionality of the very complex physiological system known as the human body.