BIODEGRADABLE MATERIALS FOR OSTEOSYNTHESIS AND TISSUE ENGINEERING

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INTRODUCTION: The development of materials for osteosynthesis has been co-continuous with the improvement of the bone fixation knowledge and the sophistication of surgical procedures. Thus, thanks to their outstanding mechanical properties, metal devices made of titanium alloys are the gold standard for the majority of the fracture fixation treatments. However, they have several significant drawbacks. First, after the fracture healing, a second operation is often necessary to remove the implants and this has several risks such as infection, removal problems of jammed implants, implants migration and associated extra health care costs. Secondly, metal devices cause magnetic resonance imaging artefacts. Finally, the high modulus of elasticity of metals compared to bone, results in the implant retaining a large fraction of the mechanical load applied to the bone. This is known as the "stress shielding" effect which leads to bone resorption. As a result, it has been thought for a longtime that a material that will resorb and which progressive mechanical properties loss could match bone healing, would improve the final outcome of fracture surgery. The quest of such material has been the initial driving force behind the research on resorbable materials for osteosynthesis, especially biodegradable polymers.[1]

BIODEGRADABLE POLYMERS: Poly(α-hydroxyacids) are still the more commonly used resorbable polymers for osteosynthesis devices. They are successful in non-load bearing applications, but their actual mechanical properties and design have not yet permit the widespread of their use. This report aims to emphasize how the actual resorbable devices properties and the lack of controlled randomized prospective trials that document their efficacy in treating a particular fracture patterns are partly responsible for the current limited use of resorbable osteosynthesis devices. Meanwhile, with the implementation of the recent gained knowledge and the better understanding of the biological mechanisms and factors influencing the living tissues regeneration, these devices could be "active" rather than "passive". Potential directions for the improvement of resorbable osteosynthesis devices and examples of the next generation of bioresorbable polymeric implants, notably resorbable hydrogel and polyurethanes carriers for tissue engineering constructs, are presented.[2] The improved control of the spatial and the temporal interfaces between the resorbable polymers and the surrounding biological tissues and cellular components is leading to hope for new cells based therapies.[3]

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