

Title: Material analysis and biomechanical concept in trauma implant failure

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The increasing number of high energy trauma and complex fractures led to the development of different types of implants. Despite of the high number of implant types, the number of implant failures has grown in the past decade. The success of fracture treatment depends on 4 major principles: anatomical reduction, stable fixation, preservation of blood supplies and early mobilization. Implant design is focusing on anatomical reduction, especially in intra-articular fractures in which secondary osteoarthritis has a high incidence. On the other hand implants have to have similar biomechanical properties to the underlying cortical or cancellous bone, which can modify its properties during healing (ex. hypertrophic callus, bone atrophy, osteoporosis). These biomechanical changes in bones can increase stress shielding mechanism on implants, leading to implant loosening and failure. An other biological aspect is, the presence of the biofilm, as a foreign body reaction, which is a decreased O₂ thin layer around the implant enhancing bacterial colonization and further bone biological changes around implants. These are the few aspects of possible causes of implant failure. These facts rise further questions which has to be discussed for new implant designs and development of new biological materials.