SURFACE DESIGN TO CONTROL SOFT AND HARD TISSUE ADHESION FOR INTERNAL FRACTURE FIXATION

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Studying cell adhesion, morphology and behaviour on prospective implant surfaces describes the surface cytocompatibility and gives an initial indication as to the appropriateness for fracture repair applications. With long term or permanent orthopaedic and osteosynthesis implants osseointegration is vital to their success. Early soft tissue integration without liquid filled capsule formation is also important for internal fixation plates. Good vascularisation is necessary at the implant / tissue interface, especially for deterrence of infection. In certain cases such as distal radius fractures where tendons have to glide over internal fixation plates, or in the cranio-maxillofacial area in orbital fractures tissue adhesion is undesirable since this prevents normal tissue motion. Bacterial adhesion to internal fracture fixation implants is always detrimental. Microtopography is one of the primary factors controlling cell and bacterial adhesion and can be used simply to control this. A method to quantify cell morphology and adhesion on implant surfaces will be shown to help determine their cytocompatibility and predict the outcome with in vivo use.

The aim of this talk will be to illustrate with some simple examples of controlling tissue adhesion to surfaces which function both in vitro and are able to withstand the harsh in vivo surroundings. Another aim of the talk will be to introduce the laboratory scientist to real examples of what happens to internal fracture fixation devices during surgical implantation.

In general, biomaterial scientists do not start at the beginning. One should look at the clinical problem first, at what material is available that may be able to be used to help this situation both biologically and mechanically, or possibly develop such a material. The material should be tested both in vitro (biologically and mechanically modelling the situation in which it will be used) considering it's strength for what it is to be used, and surface design before initiating in vivo testing. Many scientists are detached from the clinical problem and have a favourite material that they test in vitro and sometimes in vivo with no true idea what the clinical problem is and after several random tests that fit the current trend, look for a use it for 'their' material. This should be discouraged.

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