Modern technologies and computer aided systems in prosthetic dentistry

Dentistry, diagnosis and therapy, have always been under the great influence of technical and technological achievements. Through the last century dentistry has shown itself to lead the medical disciplines in embracing new materials and new technologies. Prosthetic dentistry has always maintained close relationships with engineering disciplines, relying mostly on production engineering. The rapid development of computer-aided (CA) technologies, which completely transformed production engineering, also left an indelible mark on dental prosthetics. The area of dental prosthetics has introduced numerous novel technologies and methods that allow the manufacture of precision, custom-made, optimal dental replacements. During the past decade, efforts have been concentrated towards an advancement of the modelling and manufacture of dental replacements by introducing modern CA systems, state-of-the-art materials and machining technologies, as opposed to the traditional way of manual manufacture, which is prone to numerous subjective errors. Amongst modern CA systems that have found broad application in this area, the most widely used are 3D-digitization systems, CAD and reverse engineering (RE), CAE, CAM, rapid manufacture (RM) (or additive manufacture that become the adopted term in the sector) and rapid prototyping (RP). The development and implementation of such technologies and systems have paved the way towards a significant advancement in conventional modelling, manufacture and the inspection of dental replacements.

The aim of this lecture is to promote the new technologies in diagnosis and therapy such as Cone Beam Imaging (CBI)-3D diagnostic image system, application of Reversible Engineering (RE) in bone augmentation procedures, additive and subtractive technologies in dental devices manufacturing, such as Selective Laser Sintering (SLS) and Direct Metal Laser Sintering (DMLS).

New technologies are advancing rapidly in dentistry. Computer aided systems are making manual tasks easier, faster, cheaper and more predictable. Additive manufacturing systems can produce complex shapes at affordable prices with little or no waste. The challenge for the dental materials research community is to marry the technology with materials that are suitable for dental application.