

PEEK Implants: Boon or Bane in Implantology???

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In the past few decades, titanium has been used as a gold standard in field of implantology. Titanium and its alloys have always been the materials of choice in implantology with almost all the ideal properties namely: physical, mechanical, chemical, biological etc.

In spite of meeting all the ideal requirements, titanium and its alloys have been associated with a number of disadvantages which include aesthetic problems due to the gray color of titanium. In some situations, there may be a soft tissue recession leading to unaesthetic display of the metal components. Not only this, there are so many concerns related to the allergic reactions in response to titanium which becomes one of the reasons for dental implant failure. There have been reports of hypersensitive reactions such as erythema, urticaria, eczema, swelling, pain, necrosis, and bone loss due to titanium dental implants in literature.

The unaesthetic properties of titanium and its alloys led to the introduction of more aesthetic implant biomaterials namely the zirconia implants which were tooth coloured, hence aesthetic and were associated with less plaque accumulation leading on to more biocompatibility. But they also lost their popularity soon since they were associated with poor mechanical properties in comparison to titanium implants.

Hence, the review of literature has been enriched with studies in relation to implant biomaterials and the controversies involved. This led to the advent of PEEK (Polyether ether ketone) implants to overcome the controversial issues in relation to metal and ceramic implants. PEEK is a top-notch organic thermoplastic polymer; with a broad spectrum of applications various fields namely medical, dentistry, aerospace, automotive and other associated areas.

PEEK, was developed by US aerospace industry in the late 1970s. Its medical usage started in the 1980s and followed in 1990s for clinical studies and manufacturing of implants. Gradually it gained popularity in the field of dentistry too. Keeping in view its excellent mechanical properties, it is also known as high performance polymer. Apart from the mechanical properties, it is also associated with other superior properties like excellent biocompatibility, less weight, high tensile strength, low moisture absorption, better flexibility etc.

Researchers also acclaim that PEEK has somewhat bone like properties since the modulus of elasticity of PEEK is closer to bone. This material has shown wonders when manufactured with Rapid Prototyping (RP) i.e. Additive Manufacturing (AM) technique. This has led to fulfil various challenges pertaining to medical and dental fields. In medicine and dentistry, PEEK materials foresee different surgical application as it can replace titanium and ceramic implants. Keeping in view the excellent properties of PEEK particularly the modified version of PEEK namely Carbon Fibre Reinforced PEEK (CFR-PEEK), it is quite versatile to be used as craniofacial (for cranioplast) and

orthopaedic spinal implants. This material is also applicable for cardiac surgery like manufacturing of heart valve prostheses and leaflet heart valves.

Since, the number of advantages outweigh the limitations, it's always encouraging to use PEEK implants particularly 3D printed PEEK implants much above the controversies of conventional metal vs ceramic implant. Furthermore, research is also needed in this regard to prove its suitability to use particularly in the dental field. Within the limitations of so many studies, PEEK material is a definitive Boon in medical as well as dental sciences.

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