

Polyetheretherketone implants: Can they replace titanium in future

Sir,

The placement of titanium (Ti) dental implants can be associated with complications such as hypersensitivity to Ti in some patients. There are studies which show Ti as an allergen, but the resources to diagnose Ti sensitivity are very limited.^[1] Polyetheretherketone (PEEK) is an organic synthetic polymeric tooth-colored material which can be placed in patients allergic to Ti and also it is a more esthetic dental implant material. In the current research, a lot of work is being done on PEEK implants to replace the traditional Ti implants since it has a lower elastic modulus than Ti. In its pure form, Young's modulus of PEEK is around 3.6 GPa which is close to that of the cortical bone. Reinforced PEEK material as abutment has high rate of biocompatibility, and it also preserves bone height and maintains the soft tissue stability.^[2]

The long-term success of dental implants mainly relies on stable osseointegration as well as how well the implant surfaces integrate with the surrounding soft tissues. The bioinert property of PEEK implants and its defective osseointegration limits its clinical use as load-bearing dental material. To overcome this problem, researcher had developed PEEK bioactive ternary composite, PEEK/nano-hydroxyapatite/carbon fiber (PEEK/n-HA/CF) and had done the *in vivo* evaluation of osseointegration by assessment of growth and differentiation of osteoblast-like MG63 cells. They found that PEEK/n-HA/CF ternary biocomposite with enhanced mechanics and biological performances hold great potential as bioactive implant material.^[3] Recently, Ti plasma immersion ion implantation technique was applied to modify the carbon fiber-reinforced PEEK (CFR-PEEK) surface, constructing a unique multilevel Ti dioxide (TiO₂) nanostructure thus, enhancing certain osteogenic properties. The multilevel TiO₂ nanostructures can selectively enhance soft tissue integration and inhibit bacterial reproduction, which will further support and broaden the adoption of CFR-PEEK materials in the dental fields.^[4] Static pressure tests with PEEK materials of unfilled grades, grades filled with TiO₂

powder, grades filled with barium sulfate powder, grades reinforced with short carbon fibers, grades reinforced with glass fibers, and grades reinforced with continuous carbon fibers were done with the maximum bite force of a first molar, and all tested materials seem to be suitable for the use as dental implants.^[5]

More extensive research of PEEK implants on animals and humans is still required to find out its long-term success and to conclude that it is the future implant material which is going to replace Ti implants with reduced cost and enhanced clinical success.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

**Sunil Kumar Mishra, Ramesh Chowdhary¹,
Puja Hazari²**

*Department of Maxillofacial Prosthodontics and Implantology,
People's College of Dental Sciences and Research Centre,
²Department of Maxillofacial Prosthodontics and Implantology,
People's Dental Academy, Bhopal, Madhya Pradesh, ¹Branemark
Osseointegration Centre India, Bengaluru, Karnataka, India*

Address for correspondence:

*Dr. Sunil Kumar Mishra,
Department of Maxillofacial Prosthodontics and Implantology,
People's College of Dental Sciences and Research Centre, Bhopal,
Madhya Pradesh, India.
E-mail: drsunilmishra19@gmail.com*

References

1. Goutam M, Giriya pura C, Mishra SK, Gupta S. Titanium allergy: A literature review. *Indian J Dermatol* 2014;59:630.
2. Najeeb S, Khurshid Z, Matinlinna JP, Siddiqui F, Nassani MZ, Baroudi K. Nanomodified PEEK dental implants: Bioactive composites and surface modification – A review. *Int J Dent* 2015;2015:381759.
3. Deng Y, Zhou P, Liu X, Wang L, Xiong X, Tang Z, *et al.* Preparation, characterization, cellular response and *in vivo* osseointegration of polyetheretherketone/nano-hydroxyapatite/carbon fiber ternary biocomposite. *Colloids Surf B Biointerfaces* 2015;136:64-73.
4. Wang X, Lu T, Wen J, Xu L, Zeng D, Wu Q, *et al.* Selective responses of human gingival fibroblasts and bacteria

on carbon fiber reinforced polyetheretherketone with multilevel nanostructured TiO₂. *Biomaterials* 2016;83:207-18.

5. Schwitalla AD, Spintig T, Kallage I, Müller WD. Pressure behavior of different PEEK materials for dental implants. *J Mech Behav Biomed Mater* 2016;54:295-304.

How to cite this article: Mishra SK, Chowdhary R, Hazari P. Polyetheretherketone implants: Can they replace titanium in future. *Eur J Prosthodont* 2016;4:41-2.

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

Access this article online	
Quick Response Code: 	DOI: 10.4103/2347-4610.190612
	Website: www.eurjprosthodont.org