

## · 基础与临床研究 ·

## 牙科树脂渗透氧化锆陶瓷材料的制备与性能研究

李维燕 孙 健

(上海交通大学医学院附属第九人民医院口腔修复科·口腔医学院,  
上海市口腔医学重点实验室, 上海市口腔医学研究所, 上海 200011)

**【摘要】目的** 制备一种牙科树脂渗透氧化锆陶瓷 (polymer infiltrated zirconia ceramic network, PICN) 材料, 检测其机械性能。**方法** 制备纯氧化锆陶瓷、纯树脂以及 4 种不同孔隙率的陶瓷支架, 实验组的陶瓷支架用树脂进行渗透得到陶瓷树脂复合材料 (PICN)。通过三点弯曲强度实验检测材料的弯曲强度和弹性模量, 采用单边切口梁法检测断裂韧性, 通过纳米压痕系统测得材料的硬度以及用扫描电镜观测材料的显微结构。**结果** 树脂渗透氧化锆陶瓷 (PICN) 材料的弯曲强度值为 135~266 MPa, 弹性模量值为 41.3~99.3 GPa, 断裂韧性值为 2.20~4.04 MPam<sup>1/2</sup>, 硬度值为 1.93~10.83 GPa。扫描电镜显示 PICN 材料中树脂在陶瓷孔隙内渗透完全。**结论** 这类树脂渗透氧化锆陶瓷材料的机械性能与人类天然牙釉质和牙本质相似, 在口腔修复领域具有良好的应用前景。

**【关键词】** 树脂渗透氧化锆陶瓷 机械性能 CAD/CAM 口腔修复材料

DOI: 10.11752/j.kqcl.2017.04.02

### Fabrication and characterization of polymer-infiltrated zirconia ceramic network dental materials

Li Weiyan Sun Jian

(Department of Prosthodontics, College of Stomatology; Ninth People's Hospital, Shanghai Jiao Tong University School of Medicine, Shanghai Key Laboratory of Stomatology, Shanghai Research Institute of Stomatology, Shanghai 200011)

**【Abstract】Objectives** To manufacture a range of polymer-infiltrated zirconia ceramic network (PICN) dental materials and evaluate the mechanical properties of these new materials. **Methods** One dense zirconia ceramic, four zirconia ceramic networks with varying porosities, and four PICNs based on the porous ceramics mentioned above were manufactured. In addition, pure polymer were prepared. After specimen preparation, flexural strength and elastic modulus were measured via the three-point bending test. Fracture toughness was determined by a single edge notch beam (SENB) method. Vickers hardness was tested by the indentation-strength system, and scanning electron microscope (SEM) was employed to observe the microstructure. **Results** The flexural strength of PICNs ranged between 135 and 266 MPa and the elastic modulus between 41.3 and 99.3 GPa, the fracture toughness ranged from 2.20 to 4.04 MPam<sup>1/2</sup> and hardness values from 1.93 to 10.83 GPa. SEM observation showed that the porous ceramic network was successfully infiltrated. **Conclusions** The polymer-infiltrated zirconia ceramic material is a successful material with mechanical behavior similar to that of natural human enamel and dentin.

**【Key Words】** Polymer-infiltrated zirconia ceramic Mechanical properties CAD/CAM Dental prosthetic materials