



Polymer Infiltrated Ceramic Network: A Literature Review

Mohammed Alyami BDS, MS, Thomas Giugliano DDS, Mijin Choi DDS, MS, MBA, FACP

Jonathan and Maxine Ferencz Advanced Education Program in Prosthodontics New York University College of Dentistry

Introduction

A hybrid ceramic material, Polymer Infiltrated Ceramic Network (PICN) (Vita Enamic, Vita Zahnfabrik, Bad Sachingen, Germany) is a recently introduced material that combines the benefits of ceramic and composite materials.¹(Figs1,2). PICN is comprised of an 86% inorganic phase, including feldspathic ceramic as the dominant phase, and a 14% organic phase composed of dimethacrylates.² This material can be used with minimal tooth preparation of 0.5 - 1 mm. Also because of its high bond strength it can be used to correct occlusal wear with minimal thickness.^{3,4,5}

Objectives

The aim of this poster presentation is to provide a literature review regarding the longevity and clinical performance of PICN restorations.

Methods

Three databases were searched: CHOCRANE, EBSCO, and PUBMED. The keywords used were “polymer infiltrated ceramic network”, “Vita Enamic”, “resin ceramic”, “CAD-CAM nanoceramic”, “hybrid ceramic AND PICN”. Selection criteria were set to identify clinical trials that were published between 2013-2020 with 2 or more years follow up.

Results

A total of 3 clinical trials on the performance of PICN crowns and a total of 2 clinical trials on the performance of Vita Enamic partial coverage restorations were identified. Table 1. gives an overview of performance of PICN restorations. PICN crowns had survival and success rates of 93.9% and 92.7%, respectively over a service time of 36 months.^{6,7,8} Crown failures were mainly due to catastrophic fractures. Survival rates for Vita Enamic partial coverage restorations were shown to be 97.0% after 3 years and most failures were due to fracture and debonding of the restorations.^{8,9}



Fig 1. VITA ENAMIC® CAD/ CAM Block



Fig 3. Fracture of PICN crown



Fig 2. PICN crown and onlay# 30,31

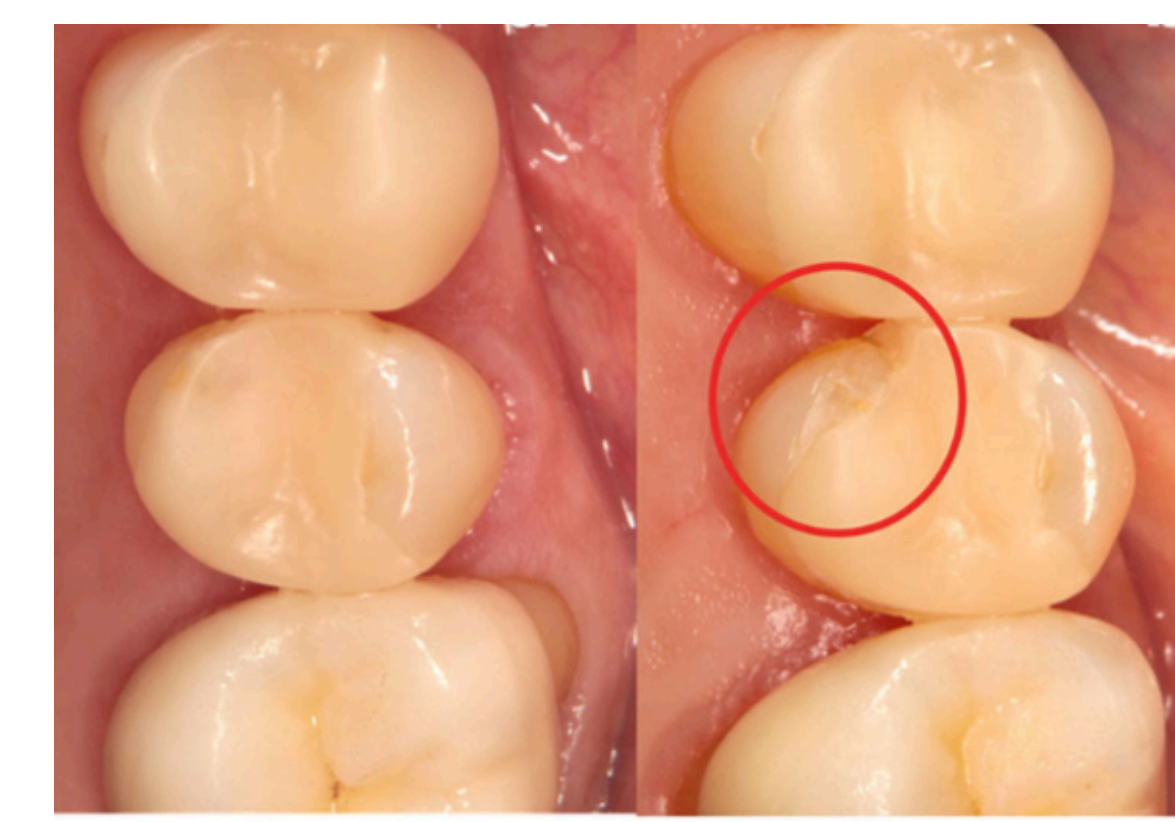


Fig 4. Fracture of PICN onlay

Table 1. Overview of PICN restorations.

Author	Year	Type of Study	Type of Coverage	N	Type of Failure	No. Failures	Failure rate %	Service time, years
Spitznagel et al ⁶	2020	Prospective Clinical Study	Single Crowns	61	Fracture	4	6.5%	3
Lu et al ⁸	2018	Randomized Clinical Trial	Single Crowns	48	Fracture	1	2.1%	3
Chirumamilla et al ⁷	2016	Retrospective Clinical Study	Single Crowns	36	Debonding	2	5.5%	2
Spitznagel et al ⁹	2018	Prospective Clinical Study	Partial Coverage Restorations	44	Fracture	2	4.5%	3
Lu et al ⁸	2018	Randomized Clinical Trial	Partial Coverage Restorations	65	Debonding and Fracture	2	3.1%	3

Conclusion

In the single crown trials a total of 145 Vita Enamic crowns were studied. Five crowns failed due to fracture (3.4%) (Fig 3) and 2 due to debonding (1.3%). Of the 109 partial coverage PICN restorations studied, 3 failed due to fracture (2.7%) (Fig 4) and 1 due to debonding (<1%). Preliminary clinical data on PICN partial coverage restoration survival rates appear promising. However, based on the nature of the failures being catastrophic fractures and debonding, the brittleness of the material under occlusal load seems high. The debonding of the material suggests that bond strength of PICN requires further investigation. Since there is still a scarcity of in-vivo studies on PICN restorations, a further clinical evaluation of Enamic restorations is necessary to identify any limitations with this material and assess its clinical performance.

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