



Implant Supported Prosthetic Treatment using Hybrid Ceramics: A Literature Review

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INTRODUCTION

Hybrid ceramic material combines the advantages of ceramics that simulate physical properties of natural teeth and advantages of polymers that have less brittleness.¹ It is a hybrid structure with two networks, ceramic infiltrated with a polymer.^{1,2} This results in a dense material having high chewing load capacity, high elasticity and flexural strength compared to conventional ceramics.³ Hybrid ceramics are being used in a variety of restorative applications like conventional single crowns, tooth-supported full arch restorations, implant supported crowns (isc), and implant supported prosthesis.³ Table 1 shows the current hybrid ceramic materials currently available.

Table 1

Brand name	Manufacturer	Material	Type
Vita Enamic	Ivoclar (Amherst, NY)	Polymer infiltrated ceramic network (PICN)	Milling block
Lava Ultimate	3M (Seefeld, Germany)	A resin modified ceramic (RMC)	Milling block
Cerec smart	Dentsply Sirona (Charlotte, NC)	Ceramic with nanofillers (RMC)	Milling block
Bego	SprintRay (Los Angeles, CA)	Ceramic with resin	3D Printable

OBJECTIVES

The objective of this study is to provide a literature review on the mechanical and clinical performance of implant supported single crowns and full arch implant supported prostheses fabricated with hybrid ceramic material.

METHODS

An electronic search was done using Medline (PubMed), CHOCRANE, EBSCO on literature published between 2010 to 2022. The key terms “PICN,” “hybrid ceramic,” “PICN implant crowns” and “PICN full arch fixed prosthesis” were used. Articles considered for inclusion were clinical trials with at least 2 years of follow-up, randomized controlled trials, meta-analyses, and systematic reviews.

Table 2. Overview of Hybrid ceramic Implant restorations

Author	Study	Factors considered	Success (%)
Spitznagel FA, 2021	In-vitro	Failure load, fracture resistance	100 (>900N)
Südbeck, 2022	In-vitro	Fracture load	92
Agustín-Panadero, 2020	Clinical	Fracture load	70
Ioannidis A, 2020	In-vitro	Bonding with N-Ti abutments	77
		Bonding with Ti Abutments	27
Grenade C, 2017	In-vitro	Biocompatibility	Excellent tissue response with HGK
Ongun S, 2018	Systemic analysis	Hybrid abutments	0

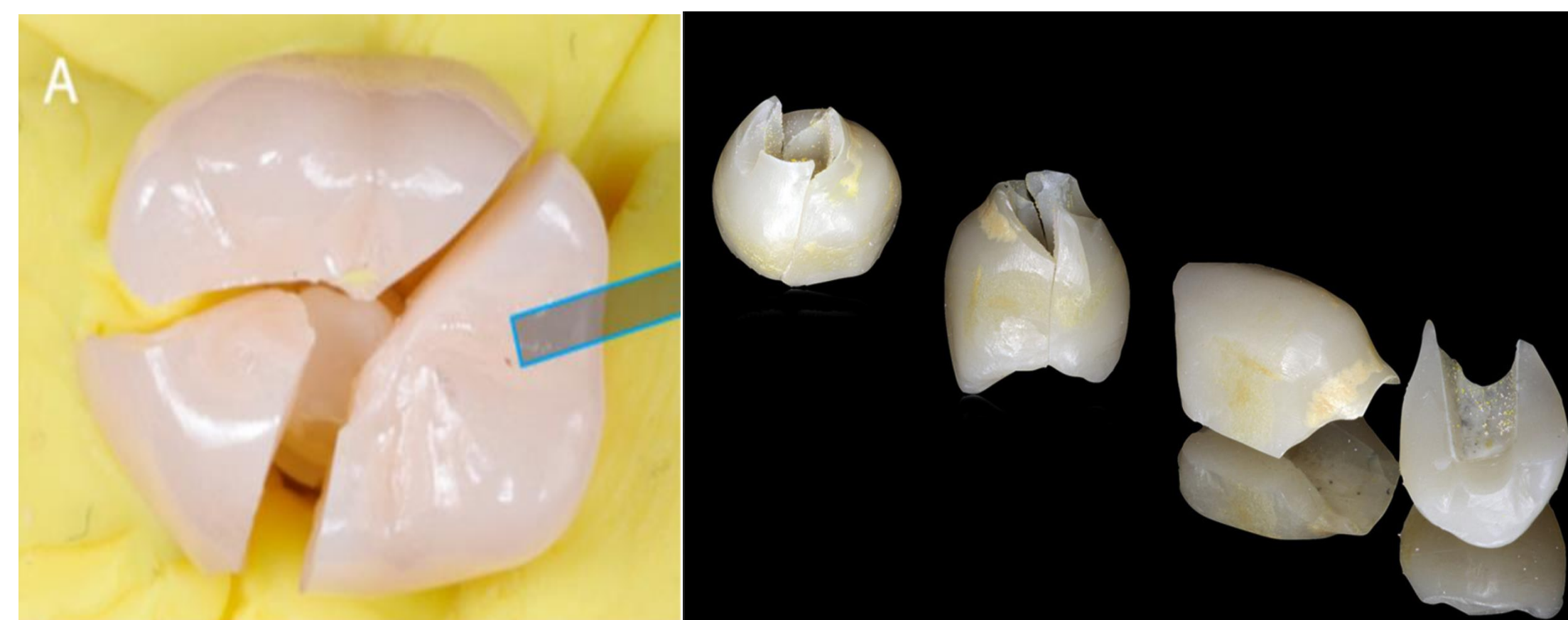


Fig. 1 Fracture of crowns⁴



Fig. 2 Implant supported RMC⁵



Fig. 3 Fracture of RMC isc⁷



Fig. 4 De-bonded RMC⁷

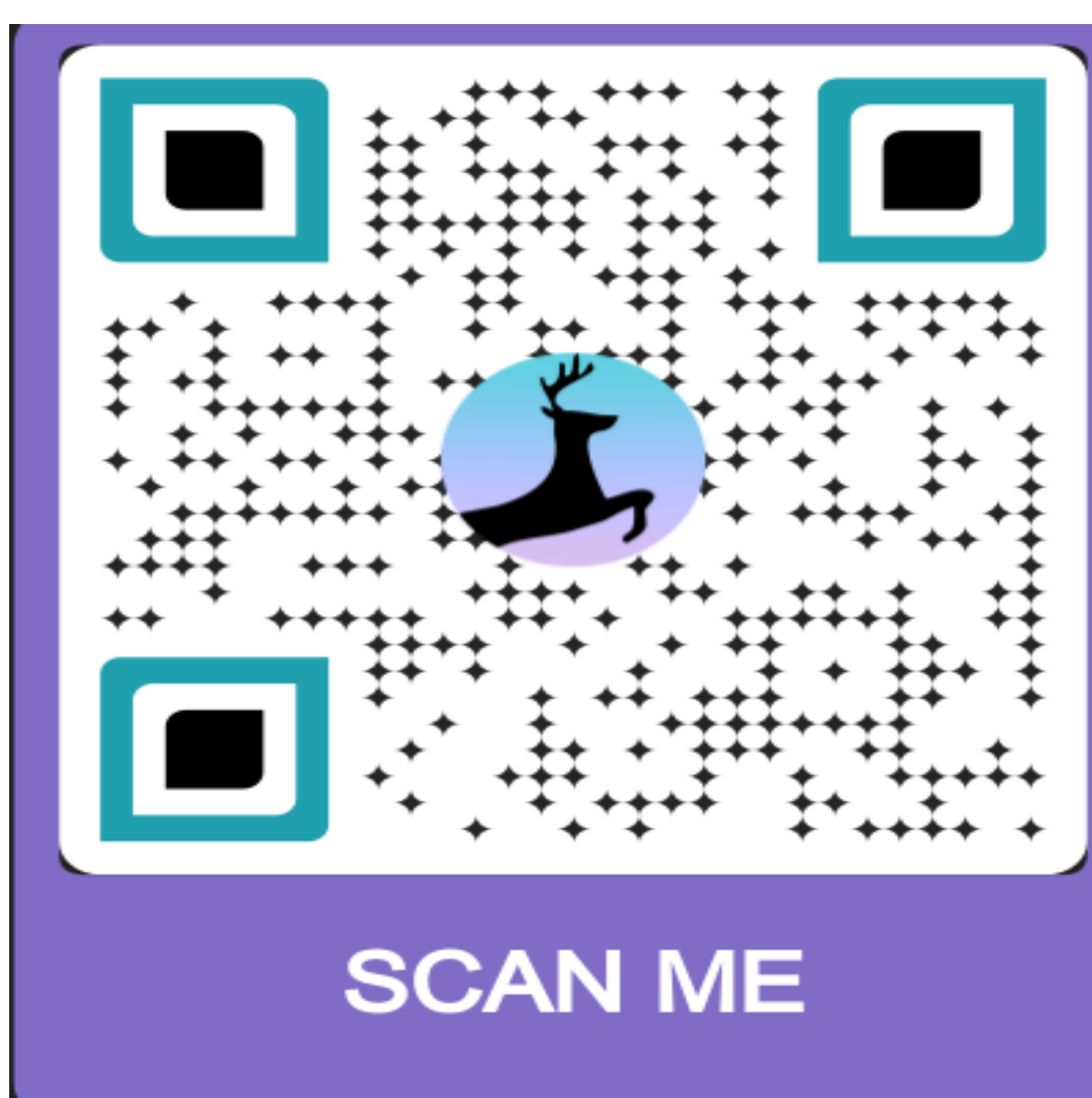
RESULTS

A total of 6 articles met the inclusion criteria. Table 2 provides an overview. 2 in vitro studies on fracture load of PICN posterior implant crowns and found 92-100% success rate (Fig. 1).^{3,4} Agustín-Panadero evaluated the clinical performance of PICN posterior single unit implant crowns and found 70% success rate with a 5 year follow up (Fig. 2).⁵ Grenade studied biocompatibility of RMC and results showed excellent tissue response.⁶ Another study on debonding showed a 77% failure rate due to a weak connection with the titanium base abutment (Fig. 3,4).⁷ Only 1 study was found with PICN as hybrid abutments with full arch prosthesis and the results showed catastrophic material fracture.⁸

CONCLUSION

The limited literature available on hybrid ceramics shows this material to have weak bond strength and lower fatigue resistance. Because of these limitations hybrid ceramics should not be used to restore cement-retained definitive implant restorations. Further studies are needed to evaluate clinical and mechanical success of hybrid ceramic materials in implant supported prostheses.

REFERENCES



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