



Porcelain Veneers vs Composite Resin Veneers: A Review

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Authors' contributions

This work was carried out in collaboration among all authors. Author JLS designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors AN, RG and KD managed the analyses of the study. Authors NB and PT managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

The main concern for clinical dentistry is the rehabilitation of lost dental aesthetics. These days' people are more conscious of how they feel about their smiles and their effect on other people. Contemporarily based upon the patient's fascination, they are various procedures and material options to select. It is quite challenging for the dentist to satisfy the needs and keep within the patient's budget. The effect of preparation design and material type on the success of dental veneers is controversial. Usually, the clinician's preference decides the preparation geometry. Nevertheless, veneers with incisal coverage seem to have better aesthetic and more predictable outcomes, while having a chamfer finish line palatable seems to be unnecessary, and limiting the preparation to a butt-join finish line is more sensible. Composite veneers provide good aesthetic outcome and patient satisfaction; however, due to its physical properties and bonding strength compared to porcelain veneers, composite veneers tend to fail significantly faster than porcelain veneers. Therefore, veneers have to compare, reviewed, and discussed in details. This review literature discusses the essential parameters.

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1. INTRODUCTION

Smile more as smiling can make you and others around you happy. Veneers are recommended treatment due to their preservation of the tooth structure, mechanical qualities, esthetic, biocompatibility, and durability. Porcelain veneers are ultra-thin shells of porcelain adhered to the outer surface of the tooth. Composite veneers consist of mainly resin matrix, inorganic filler, and coupling agent attached to the outer surface. Both are made to match the teeth aesthetics, whiter, and improve the overall smile.

Veneer restorations are used to improve the colour of stained teeth, alter the contours of misshapen teeth, close single or multiple interproximal spaces between the teeth, and improve the appearance of related or malpositioned teeth. It is also used to lengthen short teeth to a more esthetic, appropriate size.

Various materials have been used in the past: acrylic resins, composites, and porcelain. Some of the recently and commonly used veneer systems include Procera & IPS Empress.

Some dental offices use CAD/CAM to produce ceramic veneers which allows the dentist to fabricate the porcelain veneer in the office. It provides the benefit of receiving porcelain veneers and having them cemented in the same appointment, similar to composite resin veneers.

2. METHODS OF DATA COLLECTION

An electronic search of publications was made using the electronic databases Medline® and PubMed®. The search was in English articles published in dental journals. The keywords were selected, listing the following seven combinations:

- (1) "Veneers"
- (2) "laminate veneers"
- (3) "composite veneer,"
- (4) "Porcelain veneer"
- (5) "Direct composite resin."
- (6) "Dental ceramic"
- (7) "Aesthetic."

All data from both electronic databases were collected, and the duplicates were deleted. Textbook references are also included as a source. The selected articles met the following inclusion criteria: Clinical trials, case reports,

review or systematic reviews and prospective studies are all written in English.

2.1 Indications for Veneers

Veneers can reshape teeth which make the procedure ideal for various clinical situations,

- Extreme discolourations, such as tetracycline staining, fluorosis, devitalized teeth, and teeth darkened by age, are not conducive to vital bleaching [1].
- Surface defects such as small cracks in the enamel caused by ageing and trauma, can weaken the enamel and stain.
- Replacement of missing or fractured parts of the teeth [2].
- Closing of diastemas area and also improving the appearance of rotated or malpositioned teeth.
- Sound teeth also create the esthetic illusion of straight teeth.
- Short teeth. These teeth can be lengthened to a more esthetic and appropriate size [2].
- Unsatisfactory colour for functionally-sound ceramic metal or all-ceramic crowns can be repaired

2.2 Contraindications for Veneers

Unlike other types of bonding, veneers have fewer contraindications.

- Patients with bruxism or parafunctional habits place undue stress on the porcelain veneers.
- An alternative can be a protective bite appliance for the patient to wear after treatment is completed to protect the veneers from clenching or grinding forces [3]
- Whole periphery of the laminate should be around the enamel, not only for adhesion to seal the veneer to the tooth surface.
- Excessively fluoridated and deciduous teeth may not etch effectively.
- Certain types of occlusion might be the problem. These include Class III and an end to end bites. However, there may still be the possibility of cosmetic treatment by contouring the lower incisors and building out the maxillary incisors [3].

- Slender small crown, which is mostly found with the lower incisors.

2.3 Case Selection for Veneers

- The prime concern of receiving veneers in the patients is a stable and charismatic occlusal relationship
- Same as other restoration, the restoration should have a healthy periodontium. Mouth breathers are poor candidates for veneers.
- Examination before the treatment is a must of any discolouration of teeth, preexisting caries.
- If enamel or massive restoration is absence, it will interrupt a surface for bonding the teeth.
- Successful of treatment depends highly on the patient's attitude and motivation to maintenance
- Nail-biting should be corrected before the treatment to avoid the shear stress on the ceramics after the veneers' cementation.

2.4 Shade Selection

- The parameter is selected mostly based on characteristics like surface form, translucency, and colour. A higher value and shade of lower Chroma can be selected, increasing translucency during polymerization of the composite luting cement.
- The translucent's final colour is determined by many factors, such as the colour of the underlying tooth structure, the thickness of the porcelain veneer, and the thickness and colour of the luting agents [4].

2.5 Tooth Preparation

During veneers, two essential principles are followed

- Preparation should be conservative and
- Retention is solely by adhesion rather than tooth preparation [5].

2.6 Types of Preparation

Four different main designs of teeth preparation

- Window preparation: the tooth is preserved at the Incisal edge
- Feather preparation incisal length is not reduced, but Bucco-palatable of Incisal edge of the tooth is prepared.

- Bevel preparation: The length of the incisal edge is reduced slightly, and Incisal edge of the tooth is prepared Bucco-palatable,
- Incisal overlap preparation: Incisal edge of the tooth is prepared Bucco-palatable, and the length is reduced (about 2 mm), so the veneer is extended to the palatal aspect of the tooth [6,7,8,9]

2.7 Effect of Preparation Design on the Survival of Dental Veneers

- Veneers have been sensitive due to the various option like material used, type of preparations, and luting cement.
- One essential aspect is investigating the tooth preparation of dental veneers and how it might affect the fracture-resistant material and reinforce the abutment tooth. Although *in vitro* studies have been conducted to evaluate the influence of different preparations design but do not mimic the actual clinical environments and factors, they can provide criteria and guidelines for the clinician and further clinical investigations [10]. An *in vitro* studies regarding the type of preparation design are given below

2.8 General Concepts

- In the majority of the literature, some features of the preparation design are highly recommended, and lab studies such as restricting the preparation to enamel are considered to be a critical factor for better bonding strength and more durable outcome [9,16,17,18]
- Preserving the interproximal contact is recommended in most of the literature and studies; this is due to preserving more enamel and tooth structure, allowing a positive seat for cementation in a conservative approach [15,19,20,21]. The clinician might face certain situations where removing the interproximal contact can provide better aesthetic results such as malaligned teeth or diastema [22,23].
- Minimal preparation is advisable as the amount of labial reduction concurrent for ceramic veneers is 0.4-0.7 mm [6,7,24]. It is due to the enamel thickness in the anterior teeth, according to Ferrari et al. (1991)

Table 1. *In vitro* studies that investigated the influence of preparation design on dental veneers

Study	Preparation Design	Method of Loading	Number of Samples	Survival Probability	Conclusion	Remarks
(Highton & Caputo)[11]	Incisal overlap- chamfer FL Window preparation Slight labial preparation only Unprepared	Four directions: Central vertical Distal vertical Central inclined Distal inclined	4 (one of each)	High Moderate Low Lowest	Labial, proximal, incisal and gingival reduction is recommended.	Samples were photoelastic teeth
(Castelnuovo et al.)[6]	Incisal overlap (1mm)-chamfer finish line Butt joint incisal reduction (1mm) Feather edge preparation Deep incisal overlap(4mm) Unprepared	Static loading at a 90-degree angle to the palatal surface of the sample	50 (10 each)	Moderate High High Low Control	Butt joint incisal reduction and feather edge prep. Provide the best retention to the restoration. Deep incisal overlap is not recommended	-
(Stappert et al.)[8]	Incisal overlap (2mm) butt joint Deep incisal overlap (3mm)- butt joint Window preparation Unprepared	Dynamic loading and thermal cycling 135-degree angle in the masticatory stimulator	64 (16 each)	High Low Low Control	Incisal overlap provides the best support. Deep preparation is not necessary.	-
(Zarone et al.)[12]	Incisal overlap- chamfer FL Window preparation	Static loading at the long axis of the tooth	4	High Low	Incisal overlap is a better design than window prep.	Samples were 3D computerised models
(Schmidt et al.)[13]	Incisal reduction – chamfer FL Incisal reduction – butt joint	Static loading at a 90-degree angle to the palatal surface of the sample	32 (8 each)	Low High	Having a chamfer FL increase the failure rate of the veneer	Amount of existing tooth structure was considered in the study
(Lin et al.)[14]	Incisal reduction – butt joint Three quarter preparation	Static loading at a 125-degree angle of the palatal surface of the sample	48 (12 each)	High Moderate	Three-quarter prep. Requires stronger material for support	Influence of restorative materials was included in the study
(Alghazzawi et al.)[15]	Incisal reduction – butt joint Three quarter preparation	Dynamic loading at a 135-degree angle of the palatal surface of the sample	60 (30 each)	High High	No significant difference between the two preparations	

2.9 Preparation Designs

- Different opinions and different results in studies investigate the influence of preparation design on the restoration's survival. Incisal overlap preparation provides more support for the restoration and distributes occlusal forces over a larger surface area. In the window preparation, the occlusal stress is high on the incisal third, which leads to a restoration fracture. Incisal translucency is achieved when the incisal edge is reduced [6, 8, 14, 11].
- It is controversial whether to add a chamfer finish line palatable or have a shoulder finish line (butt joint). Troedson and Dérand (1999) [25] and Zarone et al. (2005) [26] report that the chamfer finish line at palatable is required to tolerate the occlusal stress.
- In contrast, Castelnuovo et al. (2000) [6] suggested the restoration's longevity. Does not depend on the chamfer finish line.
- Advantage in having a single insertion path because it prevents any veneer displacement during cementation

2.10 Effect of Material Type on the Survival of Dental Veneers

- The most common material used in veneer are porcelain, and resin composite. Each material type has different composition, characteristics, and how they fabricate. Therefore, the treatment outcome and longevity are expected to differ according to the material used (Font et al. 2006) [27]. Multiple clinical studies illustrating the survival rate of dental veneers are given below.

2.11 Porcelain Veneers

- One of the most common materials used to fabricate laminate veneers is feldspathic porcelain (Fig. 1). Feldspathic porcelain main component is feldspar, which is a naturally occurring glass that contains aluminum oxide, potassium oxide, sodium oxide, and silicon oxide (Layton & Walton, 2012) [35,36].
- Feldspathic porcelain has numerous advantages; the material is fragile, so it can be almost translucent, which results in an appearing natural restoration. Also, it requires minimal tooth preparation. Therefore enamel can be preserved.

Besides, it is possible to etch feldspathic porcelain with hydrofluoric acid, which gives an excellent bonding strength to the remaining enamel (Calamia 1982, Nicholls 1988, Stacey 1993, Layton & Walton 2012) [40, 41, 42, 36]. Due to which feldspathic porcelain has little disadvantages.

- Two methods can do the fabrication of feldspathic porcelain: the platinum foil technique and the refractory die (Horn 1983, Plant & Thomas 1987; Clyde & Gilmour 1988) [43,44,7]. These methods are technique sensitive, and the fabricated veneer requires good care before bonding (Layton & Walton, 2012,) [36]. Masking of heavily discoloured teeth might be difficult because the porcelain is very fragile.
- It was reported that micro-cracks are caused by etching the porcelain's inner surface, leading to a decrease in the porcelain's flexural strength and fracture of the veneer (Yen et al., 1993) [45,46].

2.12 Resin Composite

- Restorative materials like resin-based composites consist of mainly three compositions like resin matrix, Inorganic filler and Coupling agent.
- The most used monomer is Bis-GMA and has a higher molecular weight than methyl methacrylate resins which makes the polymerization shrinkage of Bis-GMA (7.5%) less significantly than methyl methacrylate resins (22%).
- Adding a wide range of fillers like quartz offer many advantages like reduction of the polymerization shrinkage, the thermal reduction coefficient of the monomer and improve mechanical characteristics.
- Barium provide finer radiopacity. With the help of saline bonding between the resin and the filler is achieved. γ - MPTS is the most commonly used in resin composite.
- According to the particle size of the filler, dental composites is categorized, mostly mean particle size consist of 10-20 μm ; micro filled composites consist of 0.02 μm .
- The dental company introduces new generations of composites over the years, leading to better physical properties and aesthetics (Bonsor & Pearson 2012, Van Noort 2013) [47,48].
- It was thought that composites in the anterior area would be replaced with porcelain veneers due to their success (Garber 1989) [39]. Nevertheless, the

aesthetic and physical properties of resin composite have improved remarkably lately. Thus, it has been used extensively in clinical practice (Wolff et al. 2010) [49].

- The composite veneer's main advantage is that it can be used directly, resulting in less chair time with an excellent initial aesthetic. However, composite veneers are more prone to discolouration and wear (Wakiaga et al. 2004) [50]. For better result, experience skill is required.
- Composite veneers do not require massive preparations. Therefore enamel can be preserved for good adhesion. It is documented that the bonding strength between etching porcelain and enamel is more remarkable than resin composite and enamel (Lacy et al., 1988; Nicholls 1988, Lu et al., 1992) [51, 43, 52].
- It has been reported that composite veneers do not remarkably restore the prepared tooth (Reeh & Ross 1994,) [37]. Even though composite veneers can be made indirectly in dental laboratories, the composite is essentially the same applied directly. Hence, it shares the same limitations and physical properties of direct composite restorations, such as polymerization shrinkage (Van Noort 2013)

[48]. Using resin composite to veneer on the anterior teeth is much convenient as it can be done in one appointment with a good aesthetic outcome and also reasonable longevity (Fig. 2).

2.13 Advantages of Porcelain Veneers vs. Composite Resin Veneers [53]

Porcelain veneers have better advantages as compared to a composite resin, include in the following.

- Porcelain veneers are fragile but are very durable when it becomes firm after bonding to the healthy tooth structure. Depending upon the maintenance porcelain veneers can last for many years.
- Porcelain veneers allow mimicking the light handling giving details of enamel, which is not found in composite resin veneers.
- Unlike other veneers, porcelain veneers resist staining as it is smoother.
- Porcelain veneers are more conservative than composite resin as only a small amount of tooth structure is removed during the procedure.



Fig. 1. A case showing before and after the treatment with porcelain veneers (Nalbandian & Millar 2009) [28]



Fig. 2. A case showing before and after treatment with direct composite veneers (Nalbandian & Millar 2009) [28]

Table 2. Clinical studies are illustrating the survival rate of dental veneers. Adapted from Peumans et al., (2000) [17]

Study	Type Of Study	Number of Veneers (Number of Patients)	Observation Period	Survival Rate	Remarks
Porcelain laminate veneers (PLVs)					
(Peumans et al.) [29]	Prospective	87 (25 patients)	5 years	93%	-
Meijering et al.) [30]	Prospective	263 (112 patients)	2.5 years	100%	-
(Dumfahrt & Schäffer) [31]	Retrospective	191 (72 patients)	1 – 10 years	91% in 10 years	Failure increase when PLVs are bonded to dentin
Magne et al.) [33]	Prospective	48 (16 patients)	4.5 years	100%	-
(Smales & Etemadi 2003)[Retrospective	110 (50 patients)	Up to 7 years	95%	Compared two different preparation designs as well
Chen et al. [34]	Retrospective	546 (not mentioned)	2.5 years	99%	All patients had tetracycline staining
(Granell et al., 2010)	Prospective	323 (70 patients)	3 – 11 years	87% over 11 years	Failure increased with the presence of composites and bruxism
(Beier et al.,) [32]	Retrospective	318 (84 patients)	Up to 20 years	94% in 5 y. – 93% in 10 y. -82% in 20 y.	50% of the patient were diagnosed with bruxism
(Layton & Walton) [36]	Prospective	499 (155 patients)	Up to 21 years	96% in 10 y. 91% in 20 y.	Bonding to enamel is a critical factor for survival
Resin composites- direct and indirect (DC –IC)					
Peumans et al., [29]	Prospective	87 (23 patients)	5 years	89%	DC-Main failure due to wear
(Meijering et al.) [30]	Prospective	263 (112 patients)	2.5 years	90% for IC - 74% for DC	Results for DC and IC
(Wolff et al.) [49]	Retrospective	327 (101 patients)	5 years	79%	Result for DC
(Gresnigt et al.) [38]	Prospective	96 (23 patients)	3.4 years	87%	Split mouth design- no difference between composite type- all DC

2.14 Disadvantages of Porcelain Veneers vs. Composite Resin Veneers [54]

Disadvantages of porcelain veneers over composite resin include the following:

Porcelain veneers need at least two appointments as fabrication is made at a laboratory. In contrast, composite resin veneers can be completed in one visit as it is done in chairside.

- Composite resin preparation consists of removing more tooth structure to allow placement of the desired shape.
- Porcelain veneers are costlier than composite veneers, as it need to fabricate at laboratory and then bond.
- Unlike composite resin, porcelain veneers cannot be repaired if any damaged and must be replaced.

2.15 Patients' Satisfaction

- Generally, aesthetic satisfaction is a complicated process as it is considered subjective [28,31].
- Many clinical studies that evaluated the longevity of porcelain veneers have also considered patients' satisfaction with the treatment, the range of satisfaction in these studies is 80-100% [47, 54, 55].
- Various studies for veneers have been conducted to evaluate patients' satisfaction with different material types. Meijering et al. (1997) [56] Porcelain veneers showed the best response from patients (93%) which is followed by indirect composite veneers (82%) and lastly direct composite veneers (67%).
- In contrast, Nalbandian and Millar (2009) [28] do not find any statistical difference between patients' responses between composite veneers and porcelain veneers.

2.16 Maintenance

- The success of any restoration depends highly on how the patient maintains their veneers.
- Maintenance should be a mutual effort for dentists and also from the patient.
- The patient should avoid ultrasonic scaling and should undergo routine hand scaling.
- Using abrasives and highly fluoridated toothpaste should not be used.

- Patients should control any oral habits like excessive biting forces and nail-biting and others.
- Soft acrylic mouth guards can be used during contact sports [57,58].

3. CONCLUSION

The effect of preparation design and material type on the success of dental veneers is controversial. Usually, the clinician's preference decides the preparation geometry. Nevertheless, veneers with incisal coverage seem to have better aesthetic and more predictable outcomes, while having a chamfer finish line palatable seems to be unnecessary, and limiting the preparation to a butt-join finish line is more sensible. According to multiple clinical studies, porcelain veneers have excellent aesthetic results, the longevity of the treatment, and patient's satisfaction; the most critical factors to ensure a successful treatment are the absence of parafunctional habits and to acquire bonding to enamel.

Respectively, composite veneers provide good aesthetic outcome and patient satisfaction; however, due to its physical properties and bonding strength compared to porcelain veneers, composite veneers tend to fail significantly faster than porcelain veneers.

Further clinical trials are needed to evaluate different composites and new ceramic systems for longer observation time. Currently, ceramics' properties indicate that they are materials capable of mimicking human enamel, and their mechanical properties are expanding their clinical applications. Therefore, based on this literature review, it is possible to conclude that the clinical success of laminate veneers depend on both the suitable indications of the patient and the correct application of the materials and techniques available for that, by the necessity and goals of aesthetic treatment.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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