The Reported Complications of Milled Ceramic Anterior Veneers with at Least One Year Follow Up: A Systematic Review

Keywords

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ABSTRACT

Purpose: To assess the available evidence regarding survival and failure rates of ceramic anterior veneers constructed utilising CAD/CAM technology, with a follow-up period of at least one year. Materials and Methods: A comprehensive electronic search was performed through Medline (Ovid), Embase, and Web of Science. The search was limited to articles published from 1970 to January 2023 and, included articles were human cohort clinical studies and randomised control trials. Results: A total of 9,449 articles were retrieved, 5,943 studies were screened and 22 were assessed for eligibility, resulting in 4 studies that met the inclusion criteria. A total of two failures were recorded, the failures involved fracture of the veneers, from a total of 1037 veneers in the included studies. No other failures were noted. Conclusions: Studies demonstrating long term survival of CAD/CAM made ceramic veneers are limited. This study shows the clinical outcomes are favourable over the short term. Given the short observation periods reported, further long-term studies are required to obtain a better understanding of the clinical outcomes and restoration survival. Clinical Relevance: The article assists clinicians with providing an update on the available evidence when considering CAD/CAM constructed ceramic veneers on anterior teeth.

INTRODUCTION

The past thirty years has seen a growing demand from patients and dentists alike for highly aesthetic, biocompatible and long-lasting restorations[1]. Dental veneers were first developed as in the 1930s with the aim to improve the shape, size and colour of the teeth by providing cover over the labial surfaces[2]. The ideal veneer should be a material that matches the natural shades of the teeth, is biologically conservative in tooth preparation design, simple to produce and implement whilst also strong enough to sustain occlusal and masticatory forces such that longevity and clinical success are ensured[3,4]. Techniques to construct a dental veneers have evolved over the past 30 years, from pressable ceramics utilising the lost wax technique to industrially pre-fabricated machinable ceramics utilising CAD/CAM systems[5].

Not only does the material of choice potentially affect the clinical performance of the veneer restoration but so too does the method of construction. A recent *in vitro* study by Guess and colleagues aimed to assess

whether different fabrication methods (i.e. pressable or CAD/CAM fabrication) of ceramic onlays affected the internal and marginal fit of the restorations to the prepared teeth. This can be extrapolated to the ceramic dental veneer. The findings suggested that regardless of the fabrication method, the marginal fit of the restorations were acceptable, however the internal fit of CAD/CAM restorations was not as well fitting as those that were constructed from the lost-wax technique[5].

The preparation of a full coverage crown is a considerably more invasive dental procedure that involves significant removal of tooth structure and an increased risk of adverse biological outcomes on the pulpal tissues and periodontium, compared to a veneer preparation[3]. The development of conservative restorative adhesive techniques to address tooth appearance issues has been made possible by advancements in bonding capability[3]. Materials such as Resin Composites, Ceramics, Porcelain, Acrylic, and Glass Ceramics used to make veneers[4], have enabled the clinician to have a plethora of options to meet the aesthetic expectations of the patient as well as to meet their financial and biological limitations.

The different types of ceramic materials available to construct dental veneers each have their own benefits and limitations[6] and these need to be considered when providing this type of treatment. Therefore it is important to differentiate between the different types of ceramics, because each will have a varying influence on the aesthetics and optical properties, tooth preparation design and the mechanical properties of the veneer and thus potentially affect the long-term survival of the prostheses and its associated clinical outcomes[7-10].

Feldspathic porcelain, whilst having excellent optical properties making them highly aesthetic, is limited by its mechanical strength, with veneer fracture being one of the main causes of clinical failure reported in the literature[11]. Development of ceramics like Lithium di-silicate have benefited from an increased mechanical strength. and maintains the aesthetic advantages. Non-etchable ceramics such as Zirconia, have superior mechanical properties but often appear more opaque than their glass-infiltrated counterparts. Resin composites provide a more cost-effective material however they have been found to be more vulnerable to colour instability[12]. The amount of preparation required of the teeth for each material type also needs to be considered. Reports of unprepared teeth, feather edge margins, chamfer and shoulder margins, all promote their own benefits and limitations[13]. This too may affect the ceramic material of choice as well as the long-term survival. Each ceramic material requires a minimum thickness to ensure the mechanical properties of the ceramic are met[6]. This in turn has a biological impact on the tooth the be prepared and may affect the long-term survival of the restoration and the prepared tooth for the patient.

The technological development and implementation of computer-aided design/computer aided manufacturing (CAD/CAM) has occurred rapidly over the past decade. The technology has enabled clinicians and their ceramists, to provide their patients with various kinds of restorations in an efficient, predictable, and cost-effective manner[14]. However, there remains uncertainty regarding potential trade-offs between speed and quality with CAD/CAM technology[15].

Modern dental practice requires clinicians to make clinical decisions based on sound scientific evidence. There is a growing trend within the dental community to incorporate CAD/CAM technology within the dental office and it is marketed as a feasible substitute for conventional indirect restorations made in dental laboratories. The rapid and continuous advancements in CAD/CAM technologies, is outpacing the research available, thus making the notion of evidence based dental practice even more difficult. This in turn may impact patient long-term outcomes[16,17]. The significant start-up costs involved with setting up certain CAD/CAM systems and the need for sufficient training in order to use the equipment effectively, makes the need to for a sound scientific data even more important for the clinician[18].

The goal of conventional methods of impression making or digital scanning is to replicate the intra-oral structures accurately so that a well-fitting, clinically acceptable prosthetic can be manufactured. The primary intention therefore of the CAD/CAM system is to produce prosthetic restorations that improves on the existing conventional techniques[19]. Therefore, if one is to implement a new technique and material into daily clinical practice, one would expect an improvement in all clinical parameters as well as a reduction in technical difficulties. The current literature is divided on whether the conventional or digital workflow produces a clinically acceptable fitting crown or veneer[20].

The aim of this systematic review was to determine the survival and reasons for failure of anterior veneers made through CAD/CAM technology after at least one year of service.

METHODS

FOCUS QUESTION

The development of a focus question, using a PICO approach *(Table 1*), was undertaken to assist with the search strategy:

Table 1. PICO.

Population	Anterior teeth requiring indirect ceramic veneer restorations
Intervention	Veneers constructed utilising CAD/CAM technology
Comparator	Veneers constructed utilising heat-pressed techniques
Outcome	Veneer failure

Do anterior teeth requiring indirect ceramic veneer restorations, constructed utilising CAD/CAM technology, have a similar failure rate to those constructed utilising heat-pressed techniques?

SEARCH STRATEGY AND STUDY SELECTION

The article was registered in PROSPERO. An electronic search of publications from 1970 to January 2023 was performed utilising three electronic databases: Medline (Ovid), Embase, and Web of Science databases.

Keywords, medical subject headings (MeSH) or Emtree were used as part of the search strategy. The MeSH terms included were the dental prosthesis, dental materials, manufacturing technique, and outcomes. The keywords included under the MeSH terms were "crown$", "veneer$*, "partial cover*", "aluminium silicate$", "ceramic$", "porcelain$", "composite resin or resin composite*", "lithium disilicate", "VITA", "enamic*", "mark II*", "cerec*", "trios*", "emax*", "empress II*", "*Computer-Aided Design/", "printing, three-dimensional", "dental restoration failure$", "prosthesis failure$", "failure$", "success$", and "survival".

The articles included for review were collated and duplicates deleted, using the Covidence software.

In addition, a manual search was also conducted utilising the reference lists retrieved from the electronic searches and peer reviewed articles.

INCLUSION CRITERIA

This systematic review was based on randomized controlled trials and cohort studies (prospective and retrospective). The additional inclusion criteria for study selection were:

- Articles published in English or Chinese languages and published in dental journals
- Mean follow-up of at least 1-year
- Human trials with at least 10 subjects
- Studies reporting details on the characteristics and outcomes of CAD/CAM made laminate veneers in the anterior region of the maxilla or mandible.

SELECTION OF STUDIES

Titles and abstracts of the searches were screened by at least two independent reviewers for possible inclusion in the review. The full text of all studies of possible relevance were obtained and reviewed for independent assessment. The selection of the final articles for review was based on the inclusion and exclusion criteria and final agreement of the included articles was established between the reviewers with any disagreement being resolved through discussion and a third reviewer, who had the final decision. If the data was missing or unclear, attempts were made to contact the authors of the articles for clarification.

EXCLUSION CRITERIA

The exclusion criteria consisted of animal studies, lab studies, case control studies, case series, systematic reviews, literature reviews, expert opinion studies, veneer restorations on posterior teeth (pre-molars and molars), and studies reporting only on pressed porcelain laminate veneers.

DATA EXTRACTION

From the included studies, information on failures of the veneers constructed utilising CAD/CAM technology was extracted and collated. The types of failures were also extracted. The failures were categorised into technical and biological failures, where technical failures included those that affected the veneer restoration (e.g. chipping, veneer fracture, debonding, discolouration etc.) and biological failures included that that affected the teeth (e.g. pulpal, periodontal, dental caries etc). The quality of the included studies was determined using the Newcastle-Ottawa Quality Assessment Form for Cohort studies guidelines and the Cochrane Collaboration's tool for assessing risk of bias in randomised trials[21,22].

The validated Newcastle Ottawa Quality Assessment Scale (NOS) was utilised to assess the quality of the included cohort (non-randomised) studies[23]. The NOS evaluates three parameters across eight separate items assessing selection, comparability and outcomes. Each item is afforded a star, except for comparability where up to two stars can be allocated. A score of 7-9 stars indicates a good quality study, 5-6 stars indicates fair quality and <5 stars is one of poor quality[24]. To assess the quality of evidence regarding the included randomised controlled clinical trials, the Cochrane Collaboration's tool for assessing risk of bias in randomised trials was used[21].

RESULTS

LITERATURE SEARCH

Two reviewers screened 5,943 titles, resulting in 22 articles selected for eligibility based on the inclusion criteria. Four articles were included in this systematic review, two randomised controlled trails and two were retrospective cohort studies. Two studies were undertaken in private practices[25,26] and two was carried within a University setting[27] *(Table 2)*.

Eighteen articles[18] were excluded. The various reasons for exclusion existed; veneers were pressed and not produced by CAD/CAM technologies, incorrect study design, or the veneer data did not differentiate between anterior teeth and posterior teeth *(Table 3)*.

CHARACTERISTICS OF THE INCLUDED STUDIES

According to the Newcastle-Ottawa Quality Assessment Form for Cohort studies guidelines, the quality scores for each of the included studies ranged from 6-7 which converted to a rating of good *(Table 4)*. The Cochrane Collaboration's tool

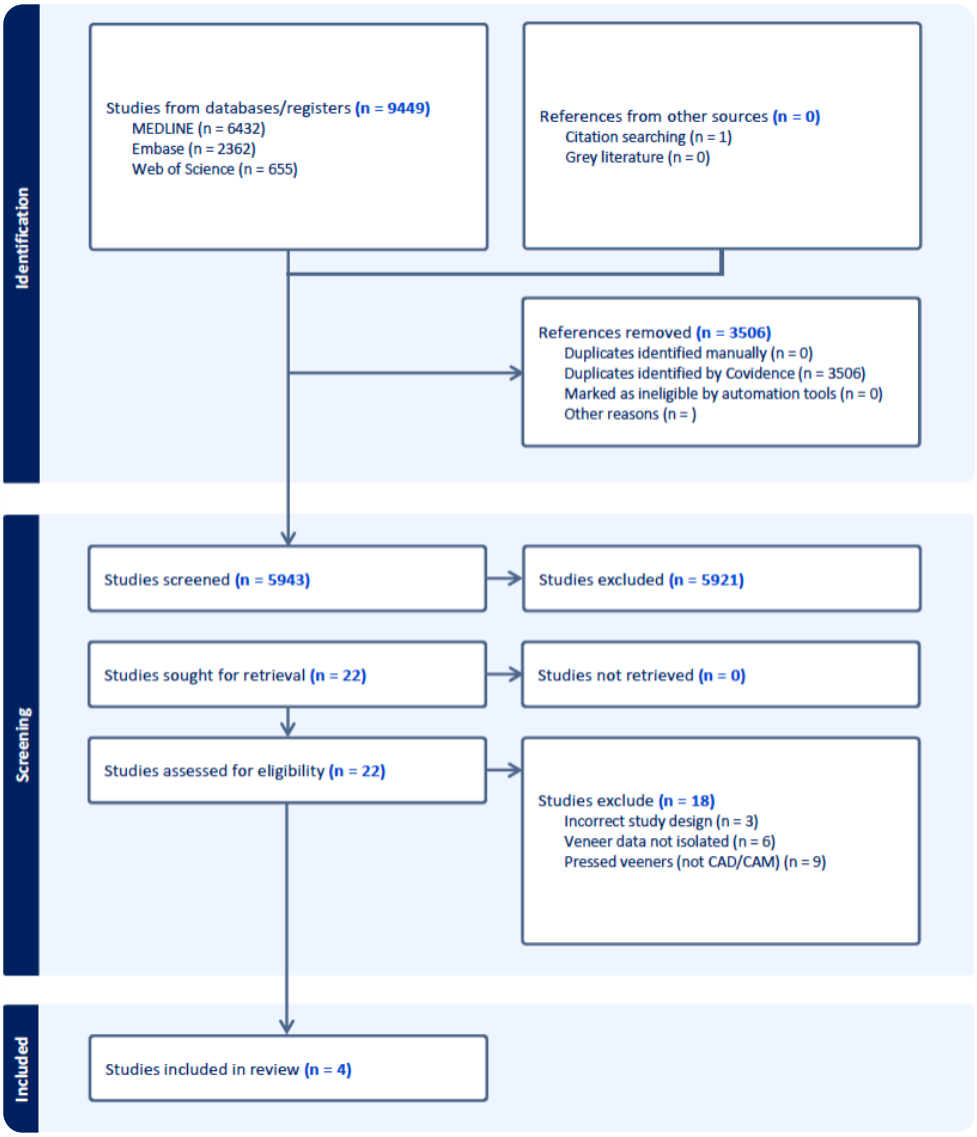

Figure 1: PRISMA flow chart.

Table 2. Included articles.

Study	Year	Study Type	Research setting
Nejatidanesh et al.[26]	2018	Retrospective Cohort	Private Practice
Yuce et al.[27]	2019	Randomised Controlled Trial	University
Imburgia et al.[25]	2020	Retrospective Cohort	Private practice
Soares-Rusu et al.[28]	2021	Randomised Controlled Trial	University

for assessing risk of bias in randomised trials was utilised for the two randomised controlled trials that were included in the study *(Table 4a)*. Both articles had a moderate of risk of bias.

The included articles reported on outcomes as survival and utilised universal indices to determine restoration failure *(Tables 5 and 6)*. These universal indices monitored time-dependent veneer degradation patterns in relation following criteria: colour matching/shade, marginal degradation/marginal integrity, sensitivity, secondary caries, and fracture. Both Imburgia and colleagues[25] and Nejatidanesh and colleagues[26] utilised a modified version of the California Dental Associated (CDA) guidelines to assess the quality of the veneer restorations at each follow-up appointment, whilst the articles by Yuce and colleagues[27] and Soares-Rusu *et al.*[28], used a modified United States Public Health System (USPHS) criteria to assess the restoration quality at each stage of follow up.

Table 3. Excluded articles and reason for exclusion.

Authors	Reason for Exclusion
Guess, P.C., Stappert, C.F. (2008)[29]	Pressed veneers (not CAD/CAM)
Gresnigt, M., Kalk, W., Ozcan, M. (2013)[30]	Pressed veneers (not CAD/CAM)
Gresnigt, M., Cune, M., Schuitemaker, J., van der Made, S., Meisberge, E., Magne, P., Ozcan, M. (2019)[31]	Pressed veneers (not CAD/CAM)
Barnes D., Gingell J., George D., Adachi E., Jefferies S., Sundar V. (2010)[32]	Pressed veneers (not CAD/CAM)
Yang, Y., Yu, J., Gao, J., Guo, J., Li, L., Zhao, Y., Zhang, S. (2016)[33]	Pressed veneers (not CAD/CAM)
Fabbri, G., Zarone, F., Dellificorelli, G., Cannistraro, G., De Lorenzi, M., Mosca, A., Sorrentino, R. (2014)[34]	Pressed veneers (not CAD/CAM)
Layton, D., Clarke, M. (2013)[35]	Study design
Nazar, A., Munir, M., Rafiq, A., Khalid, S., Hassan, H. (2021)[36]	Pressed veneers (not CAD/CAM)
Jin, E., Yan, L., Wang, J., Jiao, Y. (2018)[37]	Pressed veneers (not CAD/CAM)
Wittneben, J., Wright, R., Weber, H., Gallucci, G. (2009)[38]	Study design
Alves de Carvalho, I., Santos Marques, T., Araujo, F., Azevedo, L., Donato, H., Correia, A. (2018)[39]	Study design
Sulaiman T.; Delgado A.; Donovan T. (2015)[40]	Pressed veneers (not CAD/CAM)
Lechte C.; Hausdorfer T.; Kanzow P.; Rodig T.; Wiegand A. (2022)[9]	Veneer data not isolated
Li R.; Jiang T.; Wang Y.; Li S.; Cheng X. (2007)[41]	Veneer data not isolated
Attia Y..; Sherif R.; Zaghloul H. (2021)[42]	Veneer data not isolated
Wiedhahn, K. and Fasbinder, D. (2005)[43]	Veneer data not isolated
Abdulrahman, S.; Von See Mahm, C.; Talabani, R. and Abdulteet, D. (2021)[44]	Veneer data not isolated
Edelhoff, D., Erdelt, K., Stawarczyk, B. and Liebermann, A. (2023)[45]	Veneer data not isolated

Table 4. Newcastle-Ottawa Quality Assessment Form for Cohort Studies.

Newcastle Ottawa Quality Assessment Form for Cohort studies

	Number of Stars			
Article name	**Selection**	**Comparability**	**Outcome**	**Quality of Evidence Rating**
Imburgia et al[25]	3	1	2	GOOD
Nejatidanesh et al[26]	3	1	3	GOOD

The article by Yuce and colleagues[27], reported 100% survival at the end of the two year follow up[27], whilst Nejatidanesh *et al*, reported 99% survival at 5 years[26]. Imburgia and colleagues reported an estimated cumulative survival of 100% at 5 years follow up of the veneers placed on anterior teeth[25]. Soares-Rusu and colleagues reported 100% survival at the end of the 12 month follow up period[28].

The number of participants ranged from 12 to 105, while the number of included veneers ranged from 27 to 635 *(Table 5)*. All veneers were placed on vital, adult teeth. The number of veneers per subject and per arch varied. The maxillary jaw received the most veneers in all four studies ranging from 27-381 veneers *(Table 6)*.

Table 4a. Cochrane Collaboration's tool for assessing risk of bias in randomised trials.

The Cochrane Collaboration's tool for assessing risk of bias in randomised trials

Article	Selection bias		Performance bias	Detection bias	Attrition bias	Reporting bias	Other bias
	Random sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Selective reporting	Confounders, funding etc
Soares-Rusu et al[28]	Unclear	Unclear	Low	High	Low	Low	Low
Yuce et al[27]	Low	High	Unclear	High	Low	Low	Low

Table 5. Number of participants and veneers included.

	Number of participants	Age range (Years)	Number of Veneers	Preparation design	Evaluation criteria
Nejatidanesh et al[26]	71	19-62	197	0.5mm chamfer and incisal overlap	CDA rating criteria
Yuce et al[27]	12	19-50	27	0.5-0.7 mm chamfer and incisal overlap (butt joint reduction 0.5-1.0 mm)	USPHS
Imburgia et al[25]	105	No record	635	0.3 mm Feather edge margin and 0.2-1.0 mm incisal reduction	Modified CDA and Ryge
Soares-Rusu et al[28]	33	18-52	178	Margin design unclear and 1.0 mm incisal reduction	USPHS

Table 6. Number of veneers per arch.

	Nejatidanesh et al	Yuce et al	Imburgia et al	Soares-Rusu et al
Maxilla	159	27	381	178
Mandible	38	0	254	0

Failure of the restoration was considered if any of the following occurred; veneer fracture, debonding (and the veneer could not be re-bonded), loss of aesthetics/function, marginal integrity and subsequent discolouration or secondary caries. The two reported failures that did occur were technical in nature and were due to fracture of the porcelain laminate veneer. The veneer fractures occurred 20 and 24 months after initial placement. The teeth were re-treated and no further complications were recorded[26]. No further complications were reported by the included studies *(Table 7)*.

DISCUSSION

Ceramic veneers, are a well-established treatment option for the conservative management of fractured, worn and unaesthetic anterior teeth ([46,47]). Despite continuous advancements in CAD/CAM technologies, the lack of sufficient studies with a suitable long-term follow up, hampers the ability of the clinician to make evidence-based decisions for the treatment options offered to patients. Yet, the use of CAD/CAM technologies does have its advantages. Since its implementation into dental practice, the applications of new materials have occurred, such as Zirconia frameworks for implant prostheses. CAD/CAM technologies has provided are more cost-effective work flow, by reduced labour costs and prosthetic construction times whilst also providing predictable outcomes and

Table 7. Included articles characteristics.

Study	Material	Number of Veneers	Mean Observation period	No. Failures	Reason for failure	Failure (%)
Nejatidanesh et al[26]	LiDiSil	197	60	2 (Failed at 20 and 24 months of service)	Veneer fracture	1.02
Yuce et al[27]	LiDiSil	27	24	0	N/A	0.00
Imburgia et al[25]	LiDiSil	635	30.8	0	N/A	0.00
Soares-Rusu et al[28]	LiDiSil	178	24	0	N/A	0

quality control[48,49]. The aims of this study were to assess the survival rates of CAD/CAM made ceramic veneers on anterior teeth and document their complications.

A total of 1037 veneers were reported in this study, from which only two complications occurred. Complications that were assessed were secondary caries, debonding of the veneer, marginal discolouration, chipping and fracture of the veneer and sensitivity. Nejatidanesh and colleagues described two failures to occur in their study, both were veneer fractures and occurred at 20 and 24 months after initial placement. Three further debonding episodes also occurred; however, these veneers were re-bonded and thus not included in the complications data. The reason for debonding was not noted[26]. In a recent systematic review by Klein *et al.* that analysed the survival and complication rates of anterior and pre-molar laminate veneers, it was determined that aesthetic and biological complications could be neglected for all types of ceramic materials in the short term and however, technical complications such as chipping and fracture of the ceramic veneer may occur, and this is in keeping with this current study[50]. A study by Ozturk *et al.* found different bonding agents exhibited varying shear bond strengths and this was also influenced by the tooth surface on which the veneer was bonded to[51]. The variation in bonding agents used between the included studies may have been a factor for the failures that did occur. No other failures or complications were noted in the included articles.

The degree of heterogeneity between the studies due to numerous confounding factors and introductions of bias, especially with regards to the variability in what was deemed a failure, the use of different evaluation criteria, the variation in tooth preparation design, variation in bonding materials used etc, made comparison between the studies and their findings difficult to determine. This also made it impossible to undertake a meta-analysis of the data.

Although all the included studies claimed to preserve maximum tooth structure during preparation, the design of the preparation in each of the included studies varied. This is considered an important factor when assessing the risk of failure of dental veneers[7,51,52]. It is well documented that the amount of tooth surface loss at presentation or upon preparation of the teeth determines the surface to which the veneer is bonded to and this in turn affects the potential long term survival outcome[8,29,51,53]. Whilst all of the studies utilised enamel bonding, the luting material used differed amongst the studies. The film thickness in turn would have an effect on the seating of the veneer which may affect the clinical behaviour. A study by Guess *et al.* noted that resin luting agents can significantly increase the marginal gap of ceramic restorations, although the gap was considered within the acceptable range of 100 um[5]. The included article by Yuce and colleagues also assessed the internal fit and marginal integrity of the pressed and CAD/CAM constructed porcelain laminate veneers. Their finding were in contrast the those of Guess and colleagues, in that the marginal gap and internal fit of both types of veneers were not statistically significant and within clinically acceptable values [27]. The likely improvement in technology could account for the improved internal fit of the CAD/CAM constructed veneer.

There can often be disagreement amongst clinicians about the point at which a restoration requires replacement. Hence the need for a standardised assessment tool[54]. The included studies used some of the common methods for assessing restoration failure, these included the modified United States Public Health Service (USHPS), California Dental Association (CDA) system and the Ryge criteria. However, these methods of assessment each vary in; their rating systems, what determines a complication or failure and the extent to when replacement of the restoration is required. Thus making it difficult to reach a clear comparison of the outcomes and results[54]. This was a similar finding in a recent systematic review by Morimoto and colleagues[10]. The variability between the studies was the main reason that a meta-analysis was not undertaken. One example is the preparation design of the veneers. The study by Imburgia and colleagues utilised a knife-edge margin design, whilst Yuce *et al.* and Nejatidanesh *et al.* both utilised a chamfer margin. Soares-Rusu *et al.* was not clear on the preparation margin[28]. The two randomised controlled trials included in this study were well designed and both had excellent retention rates of the participants with no loss to follow up in either study, however they were both deemed to have

a moderate level of bias due to several different factors, and hence the data provided by these studies needs to be read with caution. Selection bias was possibly present in the article by Soares-Rusu *et al.*[28], given the method of randomisation was not recorded. The blinding of assessors was also documented, and the reader could take this as a given, however depending on the clinical experience of the assessor it may be possible to identify the veneers made from CAD/CAM and those that were pressed. This may also affect the reporting of the data as well. The article by Yuce *et al.*[27] had a moderate risk of detection and reporting bias. There was no mention as to whether the assessors were blinded to the type of veneers that were placed and there was collaborative agreement on findings for each patient assessed.

The review was limited by the available evidence regarding the long-term survival or success rates of CAD/CAM indirect veneer restorations. This is in keeping with the limitations outlined in the systematic review undertaken by Layton and Clarke more than ten years prior[55]. The data provided in this current review should be analysed with caution given the limited number of articles included in the study and with a short minimum observation period (2-5 yrs). This was surprising, given the increased prevalence CAD/CAM technologies and the preference towards metal free restorations in modern dental practice[56,57]. The initial literature search was too narrow given a follow up period of at least five years, subsequently, the minimum follow-up period was reduced to one year. This fielded a greater number of articles from which to review. Although 5943 articles were screened, many of the articles were laboratory-based studies, or there was no distinction between the type of ceramic restoration placed or if there was, often the location of the veneers was not specified. Therefore, many studies often reported on the survival and complications of ceramic veneers made from CAD/CAM technologies, but did not distinguish between anterior and posterior teeth. This is a concern given the variations in occlusal load between the anterior and posterior segments of the mouth. This study aimed to assess only the anterior teeth to provide some level of homogeneity for comparisons.

The inclusion criteria were developed to encompass any tooth-coloured CAD/CAM material that may be used to construct dental veneers. However, Lithium Disilicate was the only ceramic reported in all of the four included studies. Numerous other studies assessed other veneering materials made from CAD/CAM technology, however the teeth that were treated was often not explicitly identified or could not be determined *(Table 2)*.

The reported survival rates of the included studies were between 99-100%. This was likely due to the short observation times of the included studies, and thus scope for further research with longer follow-up periods is needed. However, it is comparable with the survival rates of porcelain laminate veneers constructed through the lost wax technique[8,35,58], but this should be made with caution given the short observation times. A systematic review by Layton and colleagues estimated a cumulative survival of 95.7% at 5 years and 95.6% at 10 years[35]. Key clinical factors such as adhesive cements used, tooth preparation and therefore veneer thickness were varied between the studies. There was no consistent preparation design between the studies. This may have affected the internal and marginal fit of the veneers[59]. The short observation times of the included studies would likely have prevented biological complications from being recorded, and hence the effects of preparation design and overall fit of the veneer restoration. The included studies did however try to account for the occlusal loading in the recruited subjects, but again this variable is difficult to control and account for, given natural biological variations, the age range of the recruited subjects, their dietary habits, and even their potential parafunctional activities (e.g. Bruxism)[60].

Within the limits of the available research, the results of this systematic review, supports the concept that ceramic veneer restorations, constructed using CAD/CAM technology, are a suitable restoration for anterior teeth in at least the short term[10,53,58], with failure rates comparable with pressed laminate veneers[10]. However further long-term studies are required, which not only consider the material factors, but also consider the operator-related and patient-related variables.

CONCLUSIONS

The long-term outcome of CAD/CAM made ceramic veneers is sparsely reported in the literature. Present outcomes are clinically favourable over the short term. Given the short observation periods reported and limited studies available, further long-term studies are required to obtain a better understanding of the clinical outcomes and restoration survival.

REGISTRATION

PROSPERO registration number: CRD42022372701

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COMPETING INTERESTS

Nil

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