Ultrathin Ceramic Veneers in the Esthetic Zone: A 36-Month Retrospective Case Series

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Purpose: To evaluate the incidence of ultrathin ceramic veneer fractures with different preparation protocols over a period of 36 months and the possible relationship with local- and patient-related factors. ***Materials and Methods:*** Adult patients who received ceramic veneers for improvement in smile esthetics were selected from a private practice pool. Restorations were grouped as conventional (prep) or ultrathin ceramic veneers following either a minimal preparation (min-prep) or no tooth preparation (no-prep) protocol. After veneer bonding, all patients were followed up at intervals of 6 months up to 36 months. A panel of clinical outcomes was recorded, and patient satisfaction was assessed at 36 months. ***Results:*** The study sample was formed by 49 patients who received a total of 194 veneers. Twelve veneers were prep, 125 were min-prep, and 57 were no-prep. Total fracture occurrence was 9.8% in 13 participants. No fractures were observed in prep veneers, while 16 out of 125 min-prep and 3 out of 57 no-prep veneers had fractures. Most fractures (13 out of 19) occurred early, within the first 12 months after bonding. Out of 194 veneers, only 1 had a catastrophic failure (0.5%), 3 had large (≥ 1 mm) chippings (1.5%), and 15 had minor (< 1 mm) chippings (7.7%). A generalized estimating equation model revealed that the odds of veneer fracture were significantly higher in men (odds ratio [OR] = 11.29), in patients who exhibited tooth wear at baseline (OR = 5.54), and in central (OR = 13.56) and lateral (OR = 10.43) incisors compared to canines and premolars. All participants indicated that they would not change to a different restorative protocol in order to have a thicker restoration and possibly less risk of fracture. ***Conclusion:*** Ultrathin ceramic veneers are a viable cosmetic dentistry treatment option that involve minimal or no tooth preparation. However, a tendency for increased early fractures was observed in the min-prep group. *Int J Prosthodont 2021;34:567–577. doi: 10.11607/ijp.7170*

Over the past four decades, cosmetic dentistry has continuously evolved through the adoption of new treatment strategies compatible with maximum patient satisfaction and minimal biologic invasion. In a therapeutic landscape historically dominated by conventional full-contoured restorations that generally involved aggressive dental preparations, the consolidation of ceramic veneers as a treatment option in the early 80s represented a significant breakthrough.[1]

Aside from strong philosophical beliefs and reluctance to modify established protocols, the main technical factor that prevented the mainstream adoption and further development of minimally invasive ceramic veneers was limited foundational knowledge in the areas of adhesive dentistry and dental materials. Major advancements in biomaterials technology and adhesive dentistry, supported by the data generated through early clinical trials, contributed to a progressive shift that germinated in the 1990s.[2]

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Fig 1 Examples of different tooth preparation modalities for ceramic veneers: prep *(left)*, minimal prep *(middle)*, and no prep *(right)*.

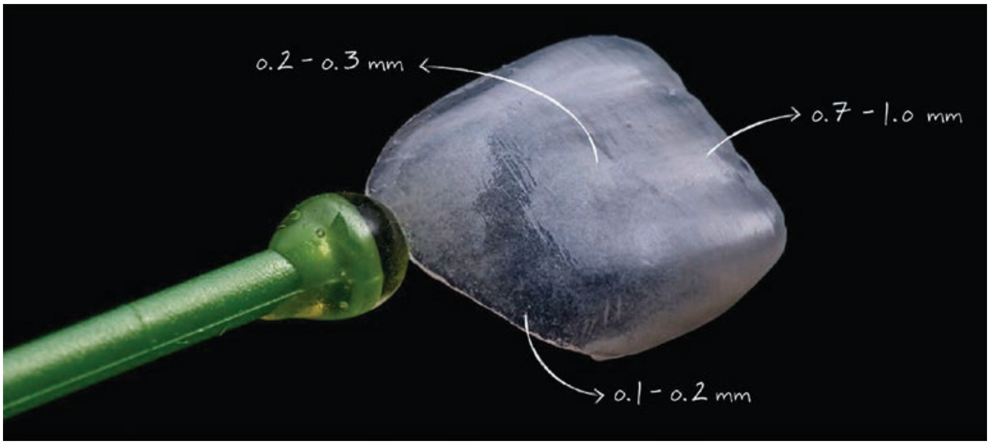

Fig 2 A high-magnification photograph of an ultrathin ceramic veneer. Note the increasing thickness from the cervical to the incisal region. Image courtesy of Dr Fernando Rey, Madrid, Spain.

Since then, the indications for ceramic veneers have expanded to achieve corrections of tooth shade and shape due to discoloration,[3] dental wear,[4] malalignment, fracture,[5] and/or malformations,[6] with the ultimate goal of obtaining a pleasing smile. In parallel with an increasing number of indications, clinical and laboratory protocols have changed to meet clinicians' expectations and patient demands. Thus, the clinical application of ultrathin ceramic veneers became a reality.[7,8]

Given the high degree of heterogeneity in the terminology used in the available literature to define different types of ceramic veneers in the function of tooth preparation protocols, it is germane to establish a unified and clinically relevant nomenclature for the purpose of clarity (Fig 1):

1. Conventional ceramic veneers (prep): These veneers are placed on teeth that undergo interproximal, incisal, and cervical reduction, usually > 1 mm, according to classic principles.[9]
2. Ultrathin ceramic veneers: Compared to conventional veneers, ultrathin veneers are generally thinner, presenting a thickness that normally ranges from 0.1 to 1 mm (Fig 2). They have the main advantage of sparing tooth substance while still allowing for the achievement of excellent esthetic outcomes.[2,5,6] Ultrathin veneers may be placed on teeth that have undergone minimal or no preparation.
   a. Minimal preparation (min-prep): These veneers are delivered on teeth that receive minimal tooth reduction aimed at *(1)* creating a favorable insertion path; *(2)* reducing the overcontouring of the restoration, which is particularly relevant in single-tooth cases; *(3)* maximizing enamel and dentin preservation; and *(4)* improving resistance and esthetics. Minimal tooth preparation involves *(1)* no cervical or interproximal finish line; *(2)* no incisal length reduction other than smoothing sharp angles; *(3)* polishing and/or rounding of acute interproximal transition lines to reduce the risk of fracture; and *(4)* beveling of the incisal third, which is required in most cases to allow for a favorable insertion path and also to increase the thickness in that zone with the purpose of improving resistance and esthetics.
   b. No preparation (no-prep): Also known as prepless, these veneers are placed on teeth that receive no tooth reduction other than smoothing minimal unsupported enamel peaks, if necessary. This treatment modality is indicated

in teeth presenting a morphology conducive to a favorable insertion path that requires shape correction (eg, microdontia, tooth wear, diastema closure) and/or masking of yellow or light brown discolorations. Contraindications are shade correction in teeth with a dark, grayish substrate and/or need to increase the restoration resistance by increasing the veneer thickness, which may lead to overcontouring. This is especially critical in single-tooth cases. It is not unusual to find in the literature or in presentations at scientific meetings examples of restorations that are incorrectly claimed to be no-prep. Actually, few teeth present ideal characteristics (shade and shape) that allow for the indication of a purely no-prep approach. Tooth anatomy and its relationship with a favorable pattern of insertion are crucial to allow for a correct veneer position, and, more importantly, for perfect adaptation and marginal seal.

Although it is well documented that conventional ceramic veneers can have a high rate of long-term success,[10–14] there is a paucity of prospective clinical studies reporting on the outcomes of ultrathin ceramic veneers and the factors associated with complications. While ultrathin veneers can render excellent esthetic outcomes with minimal or even no preparation, their fragility has raised questions pertaining to functional performance. Hence, this study evaluated the incidence of ceramic fractures of ultrathin feldspathic veneers over a period of 36 months. Additionally, the possible association between local- and patient-related factors and veneer fractures was explored. A null hypothesis of no influence of patient or dental factors on the incidence of ultrathin veneer fractures was tested.

MATERIALS AND METHODS

Experimental Design, Clinical Settings, and Registration

This clinical study was designed as a retrospective case series. It was conducted and reported in compliance with the PROCESS (Preferred Reporting Of CasE Series in Surgery) guidelines.[15] The clinical component of the study was conducted in a private practice setting (Gonzalez + Solano Atelier Dental, Madrid, Spain) between December 2015 and December 2019. The study was registered in a publicly accessible database for clinical studies (www.researchregistry.com; identifier: 5595).

Eligibility Criteria and Recruitment

Adult patients (older than 18 years of age) in good systemic health (ASA I or II) who received ceramic veneers to enhance their smile esthetics with ceramic restorations from maxillary first bicuspid to first bicuspid were selected. Patients presented with esthetic concerns regarding their smile due to periodontitis sequelae; microdontia or loss of tooth substance because of attrition, abrasion, or erosion; or a combination of these factors. The exclusion criteria were as follows: *(1)* unstable periodontal condition; *(2)* unfavorable occlusal scheme, defined as presence of posterior bite collapse, deep overbite, or minimal or no overjet; and *(3)* mental disabilities that may interfere with compliance.

Clinical Procedures

All participants received their ceramic veneers between December 2015 and December 2016. Detailed follow-up records through December 2019 were available.

An experienced clinician (O.G.) treated all patients. Thorough treatment planning based on clinical and radiographic examination, photographic and cast analysis, and a study of the occlusal scheme on articulated casts was performed in all cases. Patients presenting limited overjet or deep overbite were referred for orthodontic treatment in order to obtain a favorable occlusal relationship. Alternatively, a posterior minimally invasive rehabilitation was performed to ensure occlusal clearance for the anterior restorations following a three-step technique.[16,17] Planning was confirmed by a patient-approved mock-up. Preparation design included three alternatives: *(1)* prep (only for teeth included in the treatment plan presenting a veneer that required replacement); *(2)* min-prep; and *(3)* no-prep. Final impressions were obtained following a one-step technique with polyvinyl siloxane (Imprint 4, 3M ESPE).

All laboratory work was performed by the same dental technician (D.S.). Casts were poured with die stone (Type IV Fujirock EP Premium, GC). Platinum foil was trimmed and adapted for every single tooth (Platinum foil, thickness 0.13 mm, Code NA 1400101; thickness 0.25 mm Code NA 1400103, Ivoclar Vivadent).[18] All veneers were made with layered leucite-reinforced feldspathic ceramic (IPS d.Sign, Ivoclar Vivadent). Ultrathin veneers had a thickness of 0.1 to 0.3 mm in the interproximal, mid, and cervical portions, and 0.7 to 1.0 mm on the incisal edge (Fig 3). The incisal length increase ranged from 1 to 4 mm (Fig 4). A try-in session was scheduled for every case (Fig 5). The intaglio surface of each veneer was treated with a 9.6% hydrofluoric acid solution (Pulpdent) for 90 seconds, washed with water, and then given an ultrasonic bath with distilled water for 4 to 5 minutes. After that, veneers were dried with oil-free air, treated with a silane coupling agent (Monobond Plus, Ivoclar Vivadent) for 60 seconds, and dried with warm air for 2 minutes.[19] Subsequently, bonding was performed using a layer of adhesive agent with no light curing (ExciTE F DSC, Ivoclar Vivadent), followed by a light-curing luting

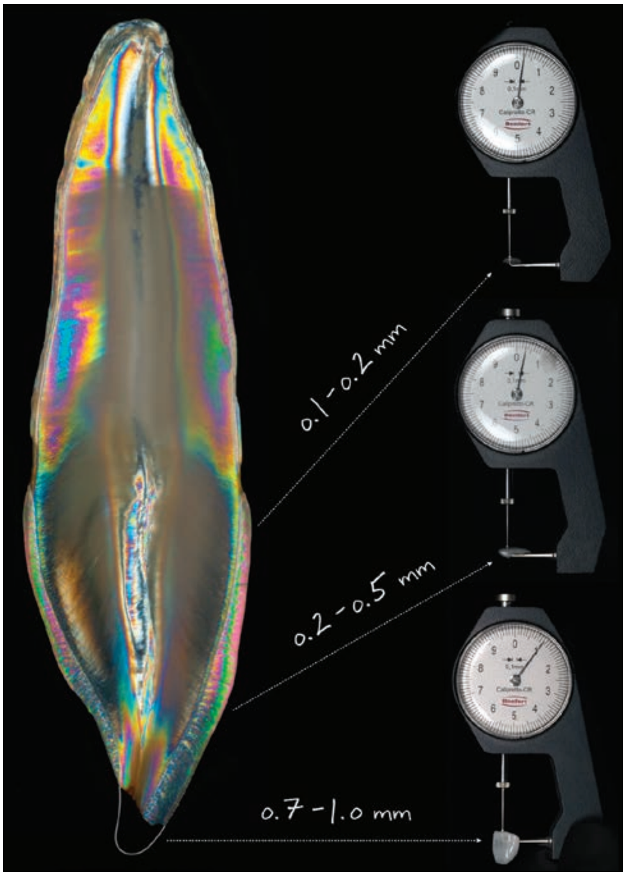

Fig 3 Sagittal section of a maxillary canine exhibiting some incisal wear under polarized light in relation to the thickness measurements of an ultrathin ceramic veneer. The thickness of the veneer varies depending on the region, with increasing thickness toward the incisal area. Image courtesy of Dr Marcos Vargas, Department of Family Dentistry, University of Iowa College of Dentistry, Iowa City, Iowa, USA.

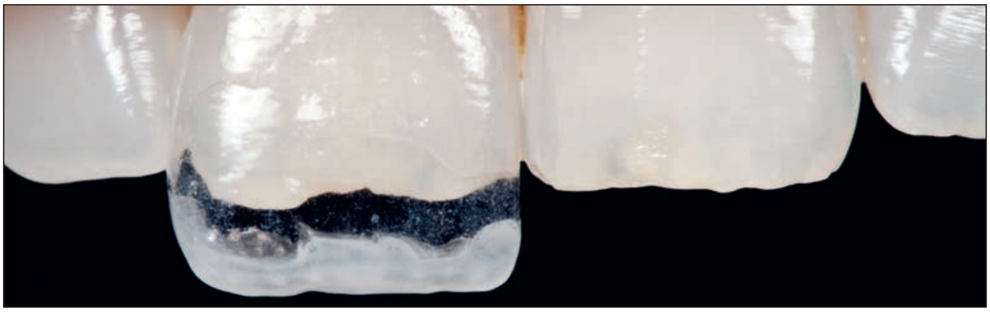

Fig 4 Incisal increase in an ultrathin veneer ranging between 1 and 1.5 mm.

Fig 5 Try-in of two ultrathin ceramic veneers on maxillary central incisors.

Fig 6 Initial presentation under *(a)* regular flash and *(b)* polarized light conditions. *(c–e)* Laboratory sequence for the fabrication of four ultrathin ceramic veneers using the platinum foil technique. *(f)* Try-in and *(g)* final aspect of the veneers after cementation.

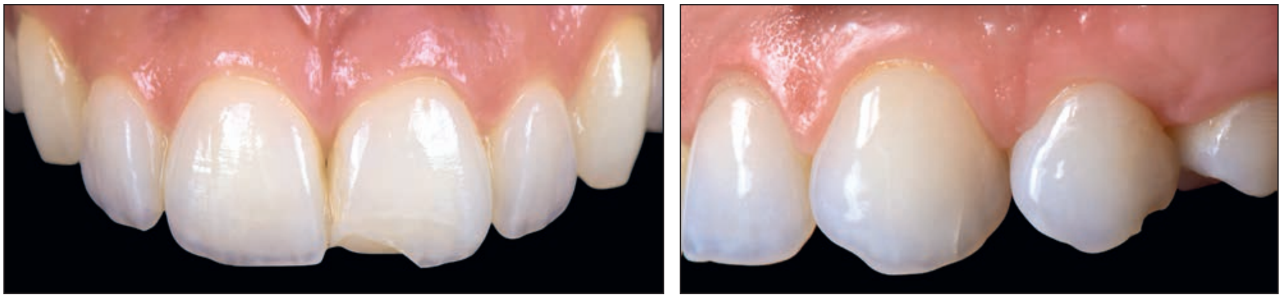

Fig 7 Clinical examples of fractured veneers.

composite (Variolink Esthetic LC, Ivoclar Vivadent). An example of a representative case is shown in Fig 6.

After bonding, all participants were scheduled for periodic follow-up visits at intervals of approximately 6 months. Each follow-up visit included a standard extra- and intraoral evaluation to ascertain the integrity of the veneers and to verify that esthetics and function were satisfactory. The presence of ceramic fractures was visually determined after careful air drying. Whenever ceramic damage was discovered or reported by the patient, the event was recorded, and the veneer was replaced or repaired, depending on the clinical presentation and the patient's preferences.

Outcomes of Interest and Data Collection

An investigator who was not involved in the treatment (A.T.) collected all data from available records. The primary outcome measure in this study was the occurrence of a ceramic fracture (Fig 7). This event was defined as any damage to the contour of the restoration. Other variables, such as type and extent of fracture, time in function before fracture, and therapeutic solution to repair fractured veneers, were also recorded. Additionally, a comprehensive set of patient-related information and treatment variables were recorded following a strict data collection process based on available standardized clinical and photographic examinations.

Table 1 Baseline Characteristics of Complete Study Population (N = 49) and Dentition

		Number	Percent
Gender	Women	32	65.3
	Men	17	34.7
History of periodontitis	No	43	87.8
	Yes	6	12.2
Incisal edge fracture	No	37	75.5
	Yes	12	24.5
Type of tooth wear	No wear	39	79.6
	Attrition only	8	16.3
	Attrition and abrasion	1	2.0
	Attrition, abrasion, and erosion	1	2.0
Fluorosis	No	44	89.8
	Yes	5	10.2
Tetracycline staining	No	46	93.9
	Yes	3	6.1
Angle class	I	35	71.4
	II	12	24.5
	III	2	4.1
Lateral excursion	Group function	6	12.2
	Canine guidance	43	87.8
Opposing antagonist	Enamel and ceramic	8	16.3
	Enamel	41	83.7
Posterior bite collapse	No	42	85.7
	Yes	7	14.3

At the 36-month follow-up visit, a clinic staff member who was not involved in the study contacted all participants via phone to ask the following "yes or no" question: "Knowing the fragility of ultrathin ceramic veneers and considering your patient experience, as well as future risk of chipping or fracture of the restoration, would you prefer a more extensive cutting of your tooth/teeth to obtain a potentially more resistant restoration?"

Statistical Analyses

Ceramic veneer survival analysis was carried out using Kaplan-Meier and log rank (Mantel-Cox) tests to obtain the overall survival rate in relation to the observation period and survival differences between preparations. Descriptive statistics were used to summarize the recorded explanatory variables that could potentially influence the incidence of ultrathin veneer fracture. Since most participants in the study had more than one dental unit restored, participants could have several outcomes measured during the study period with intrapatient correlations. To reconcile the lack of independence (correlation) of dental units within patients, the generalized estimating equation (GEE) binary method was used. The analysis was performed in two steps following a hierarchical backward elimination approach. First, each of the explanatory independent variables listed was separately entered into the model. Then, all explanatory variables with a P value < .25 in the univariate analysis were included in the multivariate analysis to determine the independent risk indicators of occurrence of ultrathin ceramic veneer fractures. All statistical tests were carried out using a statistical software package (SPSS 24, IBM). Statistical significance was set at $P < .05$.

RESULTS

Population

A total of 49 participants were included in the study. This population included 32 women (65.3%) and 17 men (34.7%) between 21 and 72 years of age, with a mean age of 44 ± 14 years. All participants were nonsmokers. Six patients (12.2%) had a history of periodontitis. A total

Table 2 Descriptive Statistics of Veneer Fractures and Therapeutic Solution Applied

		Number	Percent
Fracture occurrence (n = 194)	No	175	90.2
	Yes	19*	9.8
Time in function before fracture (n = 19)	< 6 mo	8	42.1
	6–11 mo	5	26.3
	12–24 mo	6	31.6
	> 24 mo	0	0
Fracture type (n = 19)	Cohesive	19	100
	Adhesive	0	0
Cohesive fracture characteristics (n = 19)	Chipping < 1 mm	15	78.9
	Chipping 1–2 mm	2	10.5
	Chipping > 2 mm	1	5.3
	Fracture (> 2 mm)	1	5.3
Therapeutic solution (n = 19)	Replacement with new ultrathin veneer	8	42.1
	Substitution with lithium disilicate restorations	4	21.1
	Composite repair	5	26.3
	Polishing	2	10.5

*No fractures occurred in teeth that received a conventional veneer preparation (ie, prep configuration). All veneer fractures presented incisal margin involvement.

of 12 participants (24.5%) presented an incisal fracture in at least one tooth involved in the treatment, and 10 of them (20.4%) exhibited signs of tooth wear at baseline. Detailed information on characteristics of the study population and treated dentition are displayed in Table 1.

Outcomes

The total number of bonded ceramic veneers was 194. Twelve veneers had a prep configuration, while 125 and 57 were min-prep and no-prep, respectively. The mean number of veneers per patient was approximately 4 (mean ± SD = 3.95 ± 3.0). Total veneer fracture incidence was 9.8% (19 out of 194 veneers) in 13 participants (26.5% of the total population), which translates to a 36-month cumulative survival rate of 90.2%. Out of 194 veneers, only 1 had a catastrophic failure (0.5%), 3 had large (≥ 1 mm) chippings (1.5%), and 15 had minor (< 1 mm) chippings (7.7%). Twelve of these veneers were completely replaced per the patient's request. Characteristics of all observed fractures and therapeutic solutions applied are presented in Table 2.

No fractures among prep veneers (100% survival rate) were recorded, while min-prep veneers had 16 fractures (87.2% survival rate), and no-prep veneers had 3 fractures (94.7% survival rate). As shown in Fig 8, no statistically significant differences in survival between different veneer preparation types were observed (Kaplan-Meier, log rank [Mantel-Cox]: 3.917; *P* > .05). Most of the fractures (13 out of 19) occurred within the first 12 months after delivery of the veneers. Characteristics of the patient population and the teeth that received ultrathin veneers with a min-prep or no-prep configuration are displayed in Table 3.

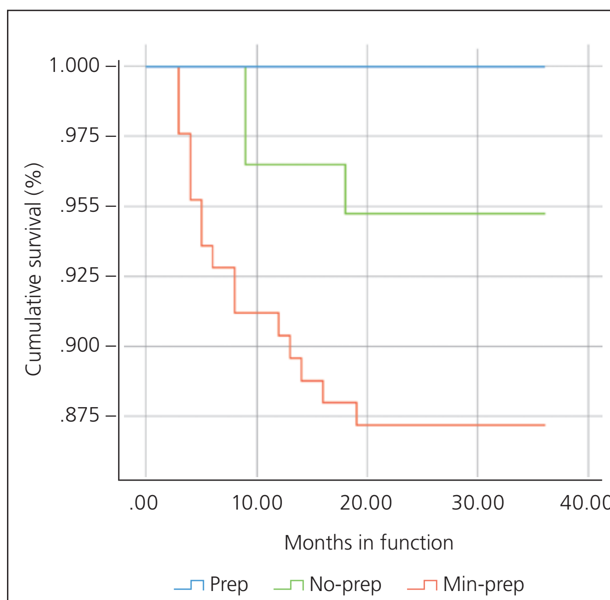

Fig 8 Event-free survival rates of the veneers according to their design.

Table 3 Characteristics of the Patients and Teeth That Received Ultrathin Veneers with a Min-Prep (n = 125) or No-Prep (n = 57) Configuration

		Total veneers (n = 182)	Intact veneers (n = 163)	Fractured veneers (n = 19)
Preparation type	Min-prep	125 (69)	109 (67)	16 (84)
	No-prep	57 (31)	54 (33)	3 (16)
Patient age, y	20–39	66 (36)	59 (36)	7 (37)
	40–59	82 (45)	74 (45)	8 (42)
	60–79	34 (19)	30 (19)	4 (21)
Gender	Women	130 (71)	125 (77)	5 (26)
	Men	52 (29)	38 (23)	14 (74)
Tooth type	Central incisor	74 (41)	63 (39)	11 (58)
	Lateral incisor	49 (27)	42 (26)	7 (37)
	Canines and premolars	59 (32)	58 (35)	1 (5)
Tooth wear	Absent	121 (66)	112 (69)	9 (47)
	Present	61 (34)	51 (31)	10 (53)
Incisal lengthening required	1 mm	75 (41)	68 (42)	7 (37)
	2–4 mm	107 (59)	95 (58)	12 (63)
Previous composite resin restorations	Absent	130 (71)	118 (72)	12 (63)
	Present	52 (29)	45 (28)	7 (37)
Lateral excursion	Group function	34 (19)	30 (18)	4 (21)
	Canine guidance	148 (81)	133 (82)	15 (79)
Posterior bite collapse	Absent	134 (74)	122 (75)	12 (63)
	Present	48 (26)	41 (25)	7 (37)
Bite guard use	No	137 (75)	127 (78)	10 (53)
	Yes	45 (25)	36 (22)	9 (47)

The influence of all of these variables on fracture risk was tested in the multivariate generalized estimating equation model.

Table 4 Variables with Significant Increased Risk in the Generalized Estimating Equation (GEE) Analysis Using Veneer Fracture as the Dependent Variable

		Estimate	OR	SE	95% CI	*P* value
Intercept		–5.757	0.003	1.1119	–7.936/–3.577	.000
Gender	Women	0	1	–	–	–
	Men	2.424	11.29	0.6387	1.173/3.676	.000
Tooth type	Canines and premolars	0	1	–	–	–
	Lateral incisors	2.345	10.43	0.8655	0.649/4.041	.007
	Central incisors	2.607	13.56	1.0930	0.465/4.749	.017
Tooth wear pretreatment	Absent	0	1	–	–	–
	Present	1.712	5.54	0.5688	0.597/2.827	.003

OR = odds ratio; SE = standard error.

The results of the GEE model indicate that, from all the variables listed in Table 3, gender, tooth wear, and position were statistically significant. The odds of ultrathin veneer fracture were 11-fold higher (OR = 11.29) in men than in women. Central and lateral incisors had approximately 13- (OR = 13.56) and 10-times (OR = 10.43) higher odds of fracture compared to posterior teeth. Participants who presented tooth wear at baseline had an odds of fracture occurrence that were roughly 5-fold (OR = 5.54) higher compared to individuals who had intact teeth (Table 4).

Finally, all patients, including those who experienced veneer fractures, responded that they would not change to a more aggressive tooth reduction in order to have a thicker restoration and possibly less risk of ceramic fracture.

DISCUSSION

Despite the consensus that minimally invasive restorative treatment should be indicated when feasible, there is substantial skepticism in the dental community regarding the clinical performance of ultrathin veneers. This is primarily due to concerns regarding their fragility, which may be associated with an increased risk of fractures. To the best of the authors' knowledge, this case series represents the first clinical study aimed at evaluating the clinical performance of ultrathin feldspathic veneers in the anterior esthetic zone.

An overall 90.2% survival rate was observed over a 36-month period. Despite the fact that Kaplan-Meier analysis rendered no statistically significant differences in survival rate across different types of veneers, min-prep veneers showed a tendency for higher failure rates (87.2%). The primary analysis defined fracture as any damage to the contour of the restoration. This is because even minimal damage could impact the esthetic outcomes in patients who are very esthetically conscious, as were those who participated in this study. However, out of 194 veneers, only 1 had a catastrophic failure (0.5%), 3 had larger chippings (1.5%), and 15 had minor chippings with an extension of less than 1 mm (7.7%). Interestingly, more complications occurred in the min-prep group. Most fractures in this study (13 out of 19) occurred within the first 12 months. This is likely due to lack of compliance (eg, not using the bite guard) and/or inadequate adaptation to the new occlusal scheme.

In a prospective study involving 31 min-prep and 31 no-prep heat-pressed veneers, no veneers failed over a 2-year observational period,[20] which contrasts with the findings from the present investigation. A retrospective study that documented the survival of 504 mainly heat-pressed veneers placed on conventionally prepared teeth showed a failure rate of 4% due to fractures over a 12-year period.[21] Another retrospective study that aimed at evaluating the performance of conventional veneers made of silicate glass-ceramic over a period of up to 20 years revealed that the estimated survival rate was 94.4% after 5 years, 93.5% at 10 years, and 82.93% at 20 years.[14] This information is in accordance with the findings from the present study, indicating that conventional veneers show a greater longevity compared to min-prep and no-prep veneers.

It is likely that the restorative material played an important role in the observed tendency for lesser longevity of ultrathin restorations. In fact, feldspathic ceramic restorations typically feature less flexural strength compared to heat-pressed ceramic,[22] which could explain the difference with the fracture rate reported hereby in comparison to the previously mentioned studies. A systematic review that included 13 articles showed that the overall cumulative survival rate of ceramic veneers over a median follow-up period of 9 years was 89% (95% CI: 84% to 94%). Interestingly, the estimated survival rates for glass-ceramic and feldspathic porcelain veneers were 94% (95% CI: 87% to 100%) and 87% (95% CI: 82% to 93%), respectively, which is similar to the present findings.[23]

Findings reported by Wolff et al, who observed that 284 out of 327 (87%) direct composite resin restorations applied to recontour teeth and close diastemas in the anterior region were intact after a mean follow-up of 27 months,[24] indicate that the performance of ultrathin veneers and direct composite restorations is comparable.

The null hypothesis of no influence of patient or dental factors on the fracture rate of minimal thickness veneers must be rejected. The multivariate analysis in fact revealed that the risk of ultrathin ceramic veneer fracture is significantly higher in male patients who exhibit signs of tooth wear at initial presentation. In fact, occlusal forces have been shown to be higher in men compared to women, which could explain this finding.[25] Hence, these types of restorations are to be carefully considered in male patients with prominent masticatory musculature. Although baseline tooth wear was associated with an increased odds of fracture (OR = 5.54) in the present investigation, tooth wear did not appear to be a factor associated with increased risk of veneer fracture in another long-term follow-up study.[21] This difference could be explained by the thicker restorations and different materials used in that study, suggesting that feldspathic ceramic may be considered as a second choice material when tooth wear is detected and ultrathin veneers are considered. A further aspect that emerged in the multivariate analysis was an increased risk of fracture for veneers placed on incisors compared to canines and premolars. A possible reason for this could be less functional loading typically exerted on the buccal aspect of posterior teeth, as well as the presence of more ceramic bulk compared to incisor sites. The presence of previous restorations did not appear to be a predisposing factor for ultrathin veneer fracture during the study period, which is consistent with the information reported in a previous study.[26]

Ultrathin veneers are not a simplified treatment protocol, but rather a highly technique-sensitive procedure both from a laboratory and clinical perspective. The authors' preferred laboratory method to fabricate this type of restoration is the platinum foil technique. This is because platinum is a noble metal with an unpaired capacity to absorb and dissipate heat. This special property allows for precise control of the ceramic baking, which is essential to achieve a pore-free veneer that retains top esthetic features. Clinically, while the no-prep design is generally more desirable because it does not involve irreversible damage of existing dental structures, the tooth shade and shape characteristics that allow its implementation are not commonly found in daily clinical practice. In the present study, only 30% of cases were suitable for no-prep veneers; therefore, in the majority of cases, minimal preparation was deemed necessary in order to create an insertion path or to eliminate undercuts.

It is worth noting that none of the study participants considered the risk of fracture as a reason to seek more resistant restorations at the expense of sacrificing dental structure due to more aggressive tooth preparations. This was true also for patients who experienced fractures. When considering this high patient satisfaction rate, it has to be accounted that maintenance or replacement of the restorations were provided free of charge, including substantial interventions, such as complete veneer replacement, composite repair, and minor polishing (Table 2). Nonetheless, it may also be argued that patients who had veneer fractures spent more time in the clinic, but this still did not appear to affect their level of satisfaction. As with any other treatment, it is important to thoroughly discuss expected benefits and possible risks in the planning stage, as well as the importance of wearing an occlusal guard, particularly with those individuals who present factors associated with an increased rate of fractures (eg, men presenting tooth wear who require restorations in incisors). It is also important to prepare patients for the possibility of replacement of fractured ultrathin veneers made of feldspathic ceramic with more resistant, although possibly less esthetic, materials, depending on the patterns and frequency of fracture. In this study, this was done in two men who received two lithium disilicate restorations each (Table 2).

This study is not exempt of limitations. The very low number of prep veneers compared to ultrathin veneers is certainly a limitation of the study and should be taken into consideration when interpreting the results. Additionally, the question to assess patient satisfaction was not asked anonymously, which may have influenced patients' responses. Finally, it must be acknowledged that the lack of significance could be due to an insufficient sample size, since there was a tendency for more fractures in minimal thickness veneers, which would seem a plausible finding.

Future longitudinal studies involving larger and more diverse populations to investigate long-term results and complications of ultrathin ceramic veneers are warranted to validate the findings of this study and further expand the knowledge base in this relevant area of restorative dentistry.

CONCLUSIONS

The overall survival rate of ultrathin ceramic veneers was 90.2% at 36 months in a population of 49 patients. The risk for veneer fracture rate is higher in men, in patients who exhibit signs of tooth wear at the initial clinical presentation, and in central and lateral incisors compared to canines and premolars. Findings from this study indicate that ultrathin ceramic veneers are a viable treatment option associated with high patient satisfaction; however, case selection and adequate clinical management are fundamental to minimize the risk of fractures.

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Literature Abstract

Long-Term Survival and Success of Zirconia Screw-Retained Implant-Supported Prostheses for up to 12 Years: A Retrospective Multicenter Study

Despite the broad clinical application of zirconia for fixed implant-supported prostheses, evidence of long-term performance is sparse. The purpose of this retrospective study was to evaluate the long-term clinical and radiographic outcomes of zirconia-based partial and complete screw-retained implant-supported zirconia fixed dental prostheses (ISZFDPs). Records of patients treated with dental implants and ISZFDPs between December 2004 and June 2017 were screened. Study participants who were eligible according to the inclusion criteria were contacted and invited to undergo clinical and radiographic examinations. Outcomes were evaluated as implant and prosthetic survival rates, prosthetic success rates, complications, marginal bone level (MBL) change, and soft tissue condition. Along with the effects of zirconia prosthesis type and level, the effects of implant type and connection, type of loading, and follow-up on MBL were tested with a generalized linear effects model (GLEM; $\alpha = .05$). A total of 118 patients were identified, of whom 20 (16.9%) were not available for clinical examination for various reasons. A total of 98 participants (mean age 60.7 ± 11.7 years) with 337 implants were included, of which 176 (52.2%) had been immediately loaded. A total of 111 ISZFDPs (96 zirconia connection and 15 titanium base) were investigated: 24 complete ISZFDPs with a zirconia connection (12.9 ± 0.97 dental units, minimum 12, maximum 14), 72 partial with a zirconia connection (3.11 ± 1.12, minimum 2, maximum 7), and 15 partial with a titanium base (3.62 ± 1.02, minimum 2, maximum 5). Forty ISZFDPs had been in function for ≥ 10 years (36%), 38 for 5 to 9 years (34.2%), and 33 for 2 to 4 years (22.8%). The mean follow-up time was 7.2 ± 3.4 years. No zirconia fractures were identified. Two implants and 2 ISZFDPs failed, with chipping being the most common complication (13.5%). The implant survival rate was 99.4%, and the prosthetic survival rate was 98.2%. The cumulative prosthetic success rate was 91.9%. MBL change was –0.18 ± 0.59 mm. Thirteen implants were treated for peri-implantitis (3.8%), and 9 for mucositis (2.7%), but presented healthy peri-implant soft tissues at the follow-up examination. A significant difference was found between the implant-level and abutment-level prostheses ($P = .013$), with less marginal bone loss observed in ISZFDPs delivered at the implant level. ISZFDPs can be considered a reliable long-term treatment option for partial and complete edentulism. No zirconia fractures were experienced. Stable bone levels and low peri-implantitis rates were reported regardless of the ISZFDP type and level, implant type and connection, and type of loading.

Pozzi A, Acruri L, Fabbri G, Singer G, Londono J. *J Prosthet Dent* 2021;S0022-3913(21)00265-1. **References:** 48. **Reprints:** Dr Alessandro Pozzi, apozzi@augusta.edu —*Carlo Poggio, Italy*