UNIVERSIDADE FEDERAL DE JUIZ DE FORA - CAMPUS GOVERNADOR VALADARES
PROGRAMA DE PÓS-GRADUAÇÃO EM CIÊNCIAS APLICADAS À SAÚDE

Victor Higor Oliveira Vidal

Análise da superfície da zircônia monolítica multicamadas mediante diferentes protocolos de polimento

Governador Valadares
2023

Victor Higor Oliveira Vidal

Análise da superfície da zircônia monolítica multicamadas mediante diferentes protocolos de polimento

Dissertação apresentada ao Programa de Pós-graduação em Ciências Aplicadas à Saúde, da Universidade Federal de Juiz de Fora, Campus Governador Valadares, como requisito parcial à obtenção do título de Mestre em Ciências Aplicadas à Saúde.

Orientador: Prof. Dr. Rodrigo Furtado de Carvalho

Governador Valadares

2023

Ficha catalográfica elaborada através do programa de geração automática daBiblioteca Universitária da UFJF, com os dados fornecidos pelo(a) autor(a)

Vidal, Victor Higor Oliveira.
Análise da superfície da zircônia monolítica multicamadas mediante diferentes protocolos de acabamento / Victor Higor Oliveira Vidal. -- 2023.
38 f. : il.

Orientador: Rodrigo Furtado Carvalho
Dissertação (mestrado acadêmico) - Universidade Federal de Juiz de Fora, Faculdade de Odontologia. Programa de Pós-Graduação em Ciências Aplicadas à Saúde, 2023.

1. Zircônia monolítica. 2. Zircônia multicamadas. 3. Zircônia multilayer. 4. Zircônia CAD/CAM. I. Carvalho, Rodrigo Furtado, orient. II. Título.

Victor Higor Oliveira Vidal

Análise da superfície da zircônia monolítica multicamadas mediante diferentes protocolos de acabamento

Dissertação apresentada ao Programa de Pós-Graduação em Ciências Aplicadas à Saúde da Universidade Federal de Juiz de Fora como requisito parcial à obtenção do título de Mestre em Ciências Aplicadas à Saúde. Área de concentração: Biociências

Aprovada em 30 de outubro de 2023.

BANCA EXAMINADORA

Prof. Dr. Rodrigo Furtado de Carvalho - Orientador e Presidente da banca

Universidade Federal de Juiz de Fora

Prof. Dr. Cleidiel Aparecido Araújo Lemos - Membro titular interno

Universidade Federal de Juiz de Fora

Prof. Dr. César Dalmolin Bergoli - Membro titular externo

Universidade Federal de Pelotas

Juiz de Fora, 27/10/2023.

Documento assinado eletronicamente por **Rodrigo Furtado de Carvalho**, **Servidor(a)**, em 30/10/2023, às 10:57, conforme horário oficial de Brasília, com fundamento no § 3º do art. 4º do Decreto nº 10.543, de 13 de novembro de 2020.

Documento assinado eletronicamente por **César Dalmolin Bergoli**, **Usuário Externo**, em 30/10/2023, às 11:00, conforme horário oficial de Brasília, com fundamento no § 3º do art. 4º do Decreto nº 10.543, de 13 de novembro de 2020.

Documento assinado eletronicamente por **Cleidiel Aparecido Araujo Lemos**, **Servidor(a)**, em 30/10/2023, às 11:01, conforme horário oficial de Brasília, com fundamento no § 3º do art. 4º do Decreto nº 10.543, de 13 de novembro de 2020.

A autenticidade deste documento pode ser conferida no Portal do SEI-Ufjf (www2.ufjf.br/SEI) através do ícone Conferência de Documentos, informando o código verificador **1549790** e o código CRC **B652C796**.

Ao Deus Criador que me sustentou e guardou desde tempos em que eu sequer tinha forma.

À minha amada esposa, Bruna, com quem compartilho não apenas a vida, mas também este mestrado. Sem ela, a realização desse sonho não seria possível.

E à minha querida filha, Maria Eduarda, minha fonte inesgotável de inspiração e impulso para voos cada vez mais altos.

AGRADECIMENTOS

Tenho tanto a agradecer, pois reconheço que nada mereço, e ainda assim Deus fez tanto por mim todos os dias. Neste mestrado, Sua graça não foi diferente e Sua presença foi notável. Agradeço ao meu Pai e Criador, que permitiu mais esta conquista.

Expresso minha profunda gratidão à minha amada esposa, Bruna, que não poupou esforços para me apoiar, desde os estudos para o processo seletivo do PPgCAS até a conclusão desta dissertação.

Aos meus pais, Ruth e Vitor Hugo, dedico meu mais sincero agradecimento pelo amor, carinho, orações e por nunca medirem esforços para moldar a pessoa que sou hoje.

À minha irmã e meu cunhado, Maria Vitória e Tiago, agradeço pelo incentivo constante e pela compreensão durante os momentos de ausência.

Meu orientador, Dr. Rodrigo Furtado de Carvalho, merece meu reconhecimento profundo. Sua orientação e compartilhamento de conhecimento foram inestimáveis durante nossa jornada de constante aprendizado.

Faço um agradecimento especial ao Professor Dr. Cleidiel Aparecido Lemos, cujo apoio e contribuições foram cruciais para a conclusão desta etapa. Também expresso minha gratidão à Dra. Edmara Lúcia Pereira do Nascimento pelo incentivo para ingressar no mestrado e pelo apoio contínuo até a conclusão deste trabalho.

Quero estender meu mais sincero agradecimento aos membros do laboratório Proteclab, onde me tornei um profissional da área de odontologia e que forneceram todo o suporte para que a presente pesquisa fosse possível.

Em suma, minha jornada até aqui foi marcada por apoio, compreensão e colaboração de pessoas extraordinárias. A cada um que contribuiu de alguma forma, meu mais profundo agradecimento.

E pelo conhecimento se encherão as câmaras de todo tipo de riquezas preciosas e deleitáveis. Provérbios 24:4

RESUMO

O presente estudo *in vitro* tem como objetivo analisar a rugosidade e a morfologia superficial da zircônia monolítica multicamadas mediante desgastes, simulando um processo de ajuste no momento da instalação e os efeitos de diferentes protocolos de polimento. Foram analisadas duas marcas diferentes de zircônia, quais sejam: Amanngirrbach Zolid FX Multilayer, Koblach, Áustria e GoldF ML Multilayer, Hong Kong, China. Foram produzidas e divididas em seis grupos com dez amostras em cada grupo (n = 10), identificados como: CO (Controle - sem desgaste), DA (EVE Diacera - roda com partículas de diamante), PA (Pasta de Polimento Diamond Paste com Óxido de alumínio), PD (Pasta de Polimento Diamond Excel com granulação de diamante), EX (Exa-Cerapol – KIT com três etapas) e GL (Glaze Paste Insync). Ressalta-se que, independentemente da quantidade de etapas de polimentos dos aludidos grupos, todas as amostras foram submetidas ao mesmo período de tempo de polimento, 60 segundos. As amostras foram confeccionadas utilizando sistema de CAD/CAM com as dimensões 2.0x3,0x2,5mm. Em seguida, foram asperizadas com lixa d'água número 1200 antes da sinterização e, posteriormente submetidas aos protocolos de polimento correspondente a cada grupo. Após a aplicação dos protocolos de polimento, foram realizadas análises quantitativas quanto à rugosidade superficial e qualitativas usando o microscópio eletrônico de varredura (MEV), antes e depois dos polimentos. Notou-se efetividade de todos os protocolos testados, gerando diferenças estatísticas significativas ($p \leq 0,05$) quando comparado antes e depois dos polimentos. Os menores valores de Ra e Rz foram observados para os grupos DA e GL. Os achados morfológicos confirmaram os achados quantitativos, evidenciando superfícies mais lisas e polidas para DA e GL. Constatou-se diferenças na rugosidade de acordo com a zircônia, para PA e EX. Conclui-se que os protocolos de polimento de superfície apresentaram diferenças na morfologia e rugosidade das amostras analisadas. Alguns protocolos de polimento podem apresentar diferenças de acordo com a zircônia.

Palavras-chave: Zircônia monolítica. Zircônia multicamadas. Zircônia multilayer. Zircônia CAD/CAM.

ABSTRACT

The present in vitro study aims to analyze the roughness and surface morphology of multilayer monolithic zirconia through wear, simulating an adjustment process during installation, and assessing the effects of various polishing protocols. Two different brands of zirconia were examined, namely: Amann Girrbach Zolid FX Multilayer, Koblach, Austria, and GoldF ML Multilayer, Hong Kong, China. They were manufactured and divided into six groups, each containing ten samples (n = 10), identified as follows: CO (Control - no wear), DA (EVE Diacera - wheel with diamond particles), PA (Diamond Paste Polishing Paste with Aluminum oxide), PD (Diamond Excel Polishing Paste with diamond grains), EX (Exa-Cerapol – KIT with three steps), and GL (Glaze Paste Insync). It's worth noting that, irrespective of the number of polishing steps in the mentioned groups, all samples were subjected to the same polishing duration of 60 seconds. The samples were created using a CAD/CAM system with dimensions of 2.0x3.0x2.5mm. They were then roughened with 1200 grit sandpaper before sintering and subsequently subjected to the corresponding polishing protocols for each group. After applying the polishing protocols, quantitative analyses were conducted concerning surface roughness, and qualitative analyses were performed using a scanning electron microscope (SEM) before and after polishing. The effectiveness of all tested protocols was evident, leading to significant statistical differences ($p \leq 0.05$) when comparing the surfaces before and after polishing. The lowest Ra and Rz values were observed in the DA and GL groups. The morphological findings confirmed the quantitative results, revealing smoother and more polished surfaces for the DA and GL groups. Differences in roughness were found depending on the type of zirconia for the PA and EX groups. In conclusion, the surface polishing protocols exhibited variations in the morphology and roughness of the analyzed samples. It is worth noting that some polishing protocols may yield different outcomes depending on the type of zirconia used.

Keywords: Monolithic zirconia. Multilayer zirconia. Zirconia CAD/CAM.

SUMÁRIO

1 INTRODUÇÃO

A zircônia tornou-se muito popular na odontologia restauradora devido a suas excelentes propriedades mecânicas que incluem alta resistência, tenacidade a fratura e biocompatibilidade. Por muito tempo utilizou-se a zircônia como subestrutura para estratificação, sendo possível esconder sua opacidade e obter resultados estéticos adequados. Em geral, tais restaurações estratificadas em zircônia apresentavam resultados estéticos superiores às alternativas de estrutura em metal com aplicação de cerâmica (ESQUIVEL-UPSHAW; HSU ABDULHAMEED; JENKINS; NEAL, REN, CLARK, 2018).

Na busca por solucionar os problemas decorrentes de fraturas nas estruturas estratificadas, os fabricantes do seguimento de materiais para odontologia desenvolveram a prótese monolítica de zircônia, eliminando a necessidade de aplicação de cerâmica de cobertura. Essa modificação tornou as próteses menos suscetíveis a fraturas e lascamentos (ESQUIVEL-UPSHAW; HSU ABDULHAMEED; JENKINS; NEAL, REN, CLARK, 2018).

Inicialmente, as zircônias monolíticas apresentavam-se com estética bastante limitada no que se refere à correspondência de cor e translucidez, tanto que seu emprego em regiões esteticamente sensíveis (região de anteriores) eram questionáveis (PEKKAN G, PEKKAN K, BAYINDIR BÇ, ÖZCAN M, KARASU B., 2020).

Posteriormente, chegou-se nas zircônias multicamadas, que apresentam melhores características estéticas, combinando boa resistência, translucidez e aprimoramento na combinação de cores (GHODSI S, JAFARIAN Z. 2018).

Com a tecnologia CAD-CAM, o processo de design e fabricação é rápido e requer menos etapas quando comparado com os métodos convencionais. Entre os diversos tipos de zircônia, aquelas que são desenvolvidas para sistemas de CAD/CAM possuem estrutura mais homogênea, o que possibilita a usinagem de peças mais finas sem perder a resistência. Além disso, devido a mudanças de composição, consegue-se atingir níveis de translucidez satisfatórios, obtendo-se excelentes resultados estéticos, especialmente com a zircônia monolítica multicamadas (ALTAN; CINAR; TUNCELLI, 2019).

Se comparada aos diversos materiais já disponíveis há muitos anos nos

métodos tradicionais de confecção de prótese dentaria, a zircônia monolítica é considerada um material essencialmente novo, havendo pouco conhecimento científico sobre suas propriedades, principalmente sobre suas limitações, comportamento estético ao longo do tempo, resistência à desgastes por pontas e durabilidade clínica (ELEANA KONTONASAKI; ATHANASIOS RIGOS; CHARITHEA ILIA; THOMAS ISTANTSOS, 2019).

A lisura da superfície das próteses odontológicas em cerâmica desempenha um papel crucial na prática clínica, impactando diretamente na saúde bucal e no conforto do paciente. Uma superfície lisa não apenas facilita a higiene oral, tornando a limpeza mais eficiente e reduzindo o acúmulo de placa bacteriana, mas também minimiza o risco de irritação gengival e inflamação. A ausência de asperezas na cerâmica promove uma interação mais suave com os tecidos circundantes, prevenindo o desgaste excessivo e contribuindo para a estabilidade a longo prazo da prótese. Além disso, a lisura adequada é essencial para evitar atritos indesejados com os dentes adjacentes e antagonistas, promovendo uma oclusão harmoniosa e prevenindo danos à estrutura dentária existente (LIMA JÚNIOR, D. A. de .; NOGUEIRA FILHO, R.; BATISTA, M. R. A. de J. .; COUTO, G. A. S. do .; LIMA, D. M. .; FIROOZMAND, L. M, 2022).

Dessa forma, mais do que conhecer as propriedades do material, torna-se relevante entender o comportamento clínico num espectro longitudinal (HABIBI et al, 2020). Entender fatores intrínsecos e extrínsecos que influenciam a durabilidade das intervenções protéticas tem aplicabilidade no cotidiano do cirurgião-dentista, sendo um dos paradigmas das pesquisas atuais na Odontologia Restauradora.

Embora no âmbito dos Materiais Dentários a zircônia monolítica desempenhe um papel fundamental com propriedades altamente satisfatórias (ÖZTÜRK; CAN, 2019), deve-se investigar até que ponto intervenções clínicas aparentemente insignificantes dos cirurgiões-dentistas podem afetar o desempenho do material nas reabilitações orais (DONOVAN; ABD AL-RAHEAM; SULAIMAN, 2018).

Importante destacar que, até o momento, existem poucos trabalhos científicos que abordem protocolos de polimento em cerâmicas multicamadas, o que demonstra a importância e a necessidade do presente estudo.

Assim, realizou-se um estudo experimental *in vitro* para analisar a superfície da zircônia multicamadas mediante diferentes protocolos de polimento.

2 ARTIGO CIENTÍFICO

O presente artigo científico foi submetido para publicação no periódico Journal of Prosthetic Dentistry, com fator de impacto 4.6 (2022) e com classificação qualis da CAPES A2. O trabalho segue com a formatação exigida pelo periódico:

Surface analysis of multilayer monolithic zirconia using different polishing protocols

MPhil, Victor Higor Oliveira Vidal,[a] DDS, Rodrigo Furtado de Carvalho[b]

Abstract

Problem: To understand the behavior of prosthetic interventions performed by dentists and identify the factors influencing their durability. Objective: To determine the most efficient surface treatment protocol for reducing roughness and grooves in multilayer zirconia. Materials and Methods: We used ten blocks of multilayer zirconia, five from Amanngirrbach Zolid FX Multilayer (Herrschaftswiesen, Koblach, Austria) and another five from GoldF ML Multilayer (Lan Duan Chang East Road, Haidian District, Beijing, China). Roughness analyses of the samples were conducted before and after polishing using a portable roughness meter (model 400,200; Digimess, São Paulo, Brazil) and scanning electron microscopy at 4000x magnification. Statistical analysis was performed using the jamovi project software (2021). Results: All protocols proved effective in reducing the surface roughness of the samples, with Group GL showing the most significant improvement, followed by Group AD. The scanning electron microscopy results aligned with the roughness findings. Conclusion: The surface polishing protocols exhibited variations in the morphology and roughness of the analyzed samples. It is important to note that the choice of polishing protocol may vary depending on the type of zirconia used.

[a] Systems Analyst in dental prosthesis laboratory, Governador Valadares, Minas Gerais, Brazil.

[b] Adjunct Professor of Dental Prosthesis, Department of Dentistry, Federal University of Juiz de Fora, Governador Valadares, Minas Gerais, Brazil.

Introduction

In the search to solve the problems resulting from fractures in the stratified structures, the manufacturers of the follow-up of materials for dentistry developed the monolithic zirconia prosthesis, eliminating the need for the application of ceramic covering. This modification made the prostheses less susceptible to fractures and chipping[1]. The multilayer zirconias, which present better aesthetic characteristics, combining good resistance, translucency and improvement in the combination of colors[2].

If compared to the various materials already available for many years in traditional methods of making dental prosthesis, monolithic zirconia is considered an essentially new material, with little scientific knowledge about its properties, especially about its limitations, aesthetic behavior over time, resistance to wear by tips and clinical durability[3].

Thus, more than knowing the properties of the material, it becomes relevant to understand the clinical behavior in a longitudinal spectrum[4]. Understanding intrinsic and extrinsic factors that influence the durability of prosthetic interventions has applicability in the daily life of the dentist, being one of the paradigms of current research in Restorative Dentistry.

Although in the field of Dental Materials monolithic zirconia plays a fundamental role with highly satisfactory properties[5], it should be investigated to what extent seemingly insignificant clinical interventions by dentists can affect the performance of the material in oral rehabilitation[6]. Thus, an in vitro experimental study was carried out to analyze the surface of multilayer zirconia using different polishing protocols.

Materials and methods

We worked with two multilayer zirconia brands: Amanngirrbach Zolid FX Multilayer, Herrschaftswiesen, Koblach Austria and GoldF ML Multilayer, Lan Duan Chang East Road, Haidian District Beijing, China.

For the elaboration of the samples, the 3D drawing was created in appropriate dental software, which automatically provided the milling path of the samples written by the computer, through the CAM software. With this, parity was achieved in the milling, wear and vibration process, even in blocks from different manufacturers.

The sample drawing software version was Exocad Valletta, Darmstadt, Germany, build 2.2 6654 2017. The version of the CAM software (milling and block course creation) was Exocad Plovdiv CAM, Darmstadt, Germany, build 3.8.31803.

Samples with the following dimensions (2,0x3.0x2.5 mm were produced). With three models of drills in the milling machine: Ceramill Tools Roto RFID 1.0mm ZI, Herrschaftswiesen, Koblach, Austria; Ceramill Tools Roto RFID 2.5mm ZI, Herrschaftswiesen, Koblach, Austria; Ceramill Tools Roto RFID 0.6mm ZI, Herrschaftswiesen, Koblach, Austria. All new, in the following milling machine model: Amann Girrbach Ceramill Motion 2 DNA Herrschaftswiesen, Koblach, Austria. It is noteworthy that twelve drill kits were used, one for each group of samples.

The sizing of the samples was determined with the purpose of encompassing the entire extent of the zirconia block. This strategy aimed to enable a more comprehensive analysis through the use of a profilometer and scanning electron microscope. For this reason, the samples were crafted utilizing the full height of the zirconia blocks.

Milling conditions were maintained for all samples, avoiding excess vibration and temperature variation at the time of machining, which promoted parity in the manufacturing environment, without forcing any of the materials to conditions that could compromise their integrity.

The samples were milled and then manually sprayed by the same operator, who used water sandpaper No. 1200 on the bench, repeating two movements for an extension of 10cm on the sheet for all samples for 10 seconds in each movement.

Then, the samples were sintered at 1520ºC for a period of 9 hours, with a temperature rise curve of 120 minutes, as well as a temperature decrease curve for 240 minutes. 10 samples were sintered at a time in the Amann Girrbach Ceramill therm 3 sintering furnace, Herrschaftswiesen, Koblach, Austria.

The samples of the two brands (Amanngirrbach Zolid FX Multilayer, Herrschaftswiesen, Koblach Austria and GoldF ML Multilayer, Lan Duan Chang East Road, Haidian District Beijing, China) were randomly divided into six groups (https://www.randomizer.org/): CO (Control), DA (EVE Diacera - wheel with diamond particles), PA (Diamond Polishing Paste with Aluminum Oxide), PD (Diamond Excel Polishing Paste with diamond granulation), EX (Exa-Cerapol – KIT with three steps) and GL (Glaze Paste Insync) (Table 01).

Table 01-Name of the groups, acronyms, descriptions of the manufacturers and polishing times

Group	Acronym	Manufacturer description	Polishing time
Controle	CO	No changes	-
EVE Diacera	DA	Discs Specially developed for work with zirconia with high concentration of diamonds (no polishing paste dispenses)	Two stages of 30s Total: 60s
Aluminum Paste	PA	Allplan Polishing Paste One Step Polishing (60s) with Extra Fine Granulated Aluminum Oxide 2 to 4 microns	One step Total: 60s
Diamond Paste	PD	FGM Polishing Paste One-step polishing (60s) with extra-fine granulation diamond (2 to 4 microns)	One step Total: 60s
Exa-Cerapol	EX	KIT Exa-Cerapol green + Exa-Cerapol pink + Cerapol white	Three stages of 20s Total: 60s
Glaze Paste Insync	GL	OdontoMega Glaze in paste	-

After sintering the samples, isopropyl alcohol was cleaned for 4 minutes by means of a sonic bath, in order to allow a better measurement of the surface roughness profile.

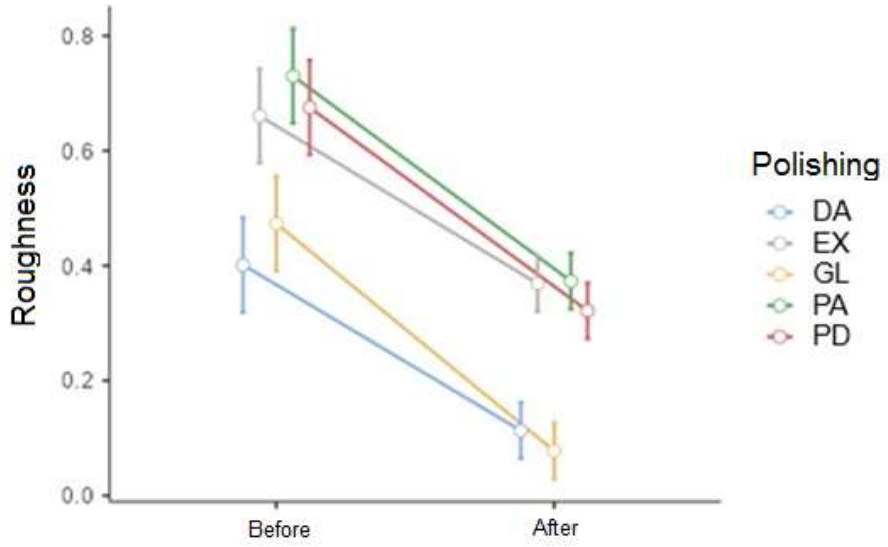
Initially, the surface roughness (Ra and Rz) was evaluated by a portable roughness meter (model 400,200; Digimess, São Paulo, Brazil) before and after polishing. The samples were subjected to five measurements from 0.25mm apart, in random areas of the surfaces, with the following roughness parameters: 0.25mm cutoff and filter gauss[7].

The data were submitted to statistical analysis in the software "The jamovi project" (2021), jamovi (Version 2.2)[8].

Two samples from each group were analyzed under scanning electron microscopy (JEOL JSM-6510; Musashino, Akishima, Tokyo), before and after polishing, with 4000X magnification.

Results

When analyzing the Ceramill samples before polishing, it was observed that the specimens of Groups DA (EVE Diacera) and GL (Glaze Paste Insync) had a lower roughness compared to the other samples. The samples of Groups EX (Exa-Cerapol), PD (Diamond Paste) and PA (Aluminum Paste) had approximate roughness. After polishing, all samples showed a decrease in surface roughness, on average, as evidenced by the decrease in the Ra value (Graph 01).



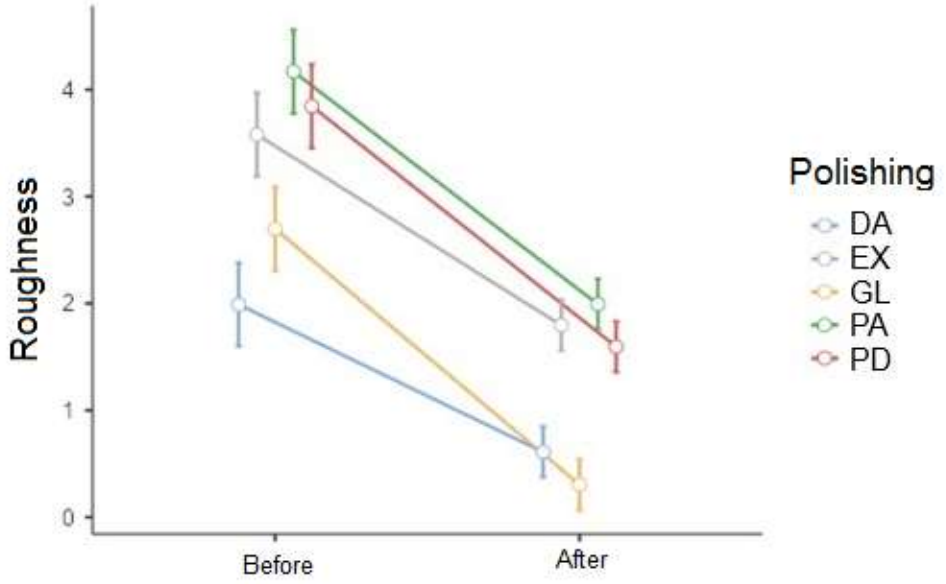
Graph 01 - Mean roughness values (Ra), before and after the different polishing protocols - Ceramill Ceramics

It is possible to observe that all polishing protocols showed a significant reduction in the value of the average roughness (Ra), that is, the samples became smoother after the polishing process. The p-value in all cases was less than 0.001, which indicates that the polishes had a real effect in reducing the roughness of the samples. The polishing protocol that presented the highest mean difference between the roughness values before and after was the GL Group, with a difference of 0.39590 (Table 02).

Table 02 – Polishing protocols; Mean and standard deviation values for mean roughness (Ra) before and after; Difference between the means and P value (before and after) – Ceramill Ceramics.

Polishing	**Before – Mean ± SD**	**After – Mean ± SD**	**Mean Difference**	**P value (Before - After)**
EVE Diacera (DA)	0.402 ± 0.155	0.113 ± 0.025	0.28850	< 0.001
ExA-Cerapol (EX)	0.661 ± 0.092	0.369 ± 0.106	0.29180	< 0.001
Glaze (GL)	0.473 ± 0.079	0.078 ± 0.027	0.39590	< 0.001
Aluminum Paste (PA)	0.730 ± 0.163	0.373 ± 0.068	0.35700	< 0.001
Diamond Paste (PD)	0.675 ± 0.136	0.322 ± 0.111	0.35380	< 0.001

When analyzing the graph of the parameters of mean roughness (Rz) before polishing, it is observed that as with Ra, the samples of Groups DA and GL presented a lower roughness when compared to the samples of Groups EX, PD and PA, which presented statistically similar values. It can be observed that all the polishes presented a significant reduction in the value of the average roughness (Rz), indicating that the samples had a decrease in the surface roughness after the polishing process (Graph 02).



.

Graph 02- Mean roughness values (Rz), before and after the different polishing protocols - Ceramill Ceramics

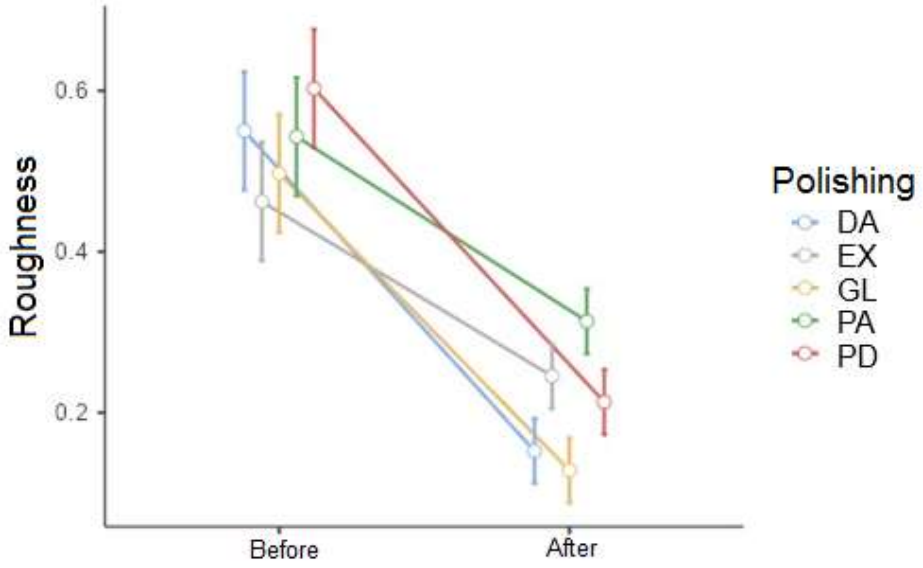
All polishing methods were effective in reducing the roughness of the sample, with significant differences between the mean values before and after in all cases (P value < 0.001). It can be stated that the GL Group presented the greatest mean reduction of surface roughness (2.39260) (Table 03).

Table 03-Polishing protocols; Mean and standard deviation values for mean roughness (Rz)

before and after; Difference between the means and P value (before and after) – Ceramill Ceramics.

Polishing	Before – Mean ± SD	After – Mean ± SD	Mean Difference	P value (Before - After)
EVE Diacera (DA)	1.99 ± 0.359	0.610 ± 0.132	1.37910	< 0.001
Excerapol (EX)	3.58 ± 0.500	1.80 ± 0.476	1.78320	< 0.001
Glaze (GL)	2.70 ± 0.334	0.304 ± 0.091	2.39260	< 0.001
Aluminum Paste (PA)	4.17 ± 0.938	1.99 ± 0.404	2.17640	< 0.001
Diamond Paste (PD)	3.85 ± 0.714	1.59 ± 0.522	2.25020	< 0.001

With regard to the GoldF ML Multilayer, observing the values of Ra before polishing, it is possible to notice that the groups are closer to each other, since the averages vary between 0.4 and 0.6. For Ra values after polishing show a significant reduction in roughness in all groups. The polishes with the best performances were GL (0.128), DA (0.152) and PD (0.213). Groups EX and BP presented similar results (Graph 03).



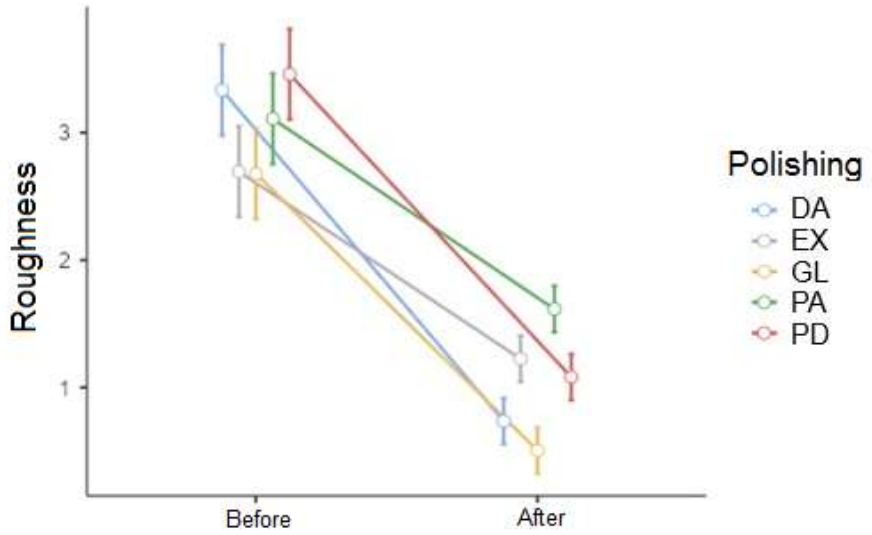
Graph 03- Mean roughness values (Ra), before and after the different polishing protocols - GoldF ML Multilayer

The polishes with the best performances were GL, with an average roughness difference of 0.3691, DA (0.39780) and PD (0.38980). The EX and PA polishes had a smaller decrease in roughness, with mean differences of 0.2169 and 0.2294.

Table 04- Polishing protocols; Mean and standard deviation values for mean roughness (Ra) before and after; Difference between means and P value (before and after) – GoldF ML Multilayer

Polishing	Before – Mean ± SD	After – Mean ± SD	Mean Difference	P value (Before - After)
EVE Diacera (DA)	0.550 ± 0.057	0.152 ± 0.035	0.39780	< 0.001
Excerapol (EX)	0.462 ± 0.112	0.245 ± 0.096	0.21690	< 0.001
Glaze (GL)	0.497 ± 0.135	0.128 ± 0.051	0.36910	< 0.001
Aluminum Paste (PA)	0.543 ± 0.086	0.314 ± 0.060	0.22940	< 0.001
Diamond Paste (PD)	0.603 ± 0.158	0.213 ± 0.060	0.38980	< 0.001

As for the parameter Rz for GoldF ML Multilayer, observing the mean roughness before polishing, it is noticed that the groups present similar values, ranging from 2.68 to 3.46. After polishing, roughness decreased significantly in all groups, ranging from 0.506 to 1.61. It is noted that the GL and AD groups resulted in the lowest roughness values after polishing (Graph 04).



Graph 04- Mean roughness values (Rz), before and after the different polishing protocols - GoldF ML Multilayer

The results showed that all polishes were effective in reducing the roughness of the samples. The p values (significance value) were all < 0.001, indicating that the differences in roughness before and after polishing were significant (Table 05).

Table 05- Polishing protocols; Mean and standard deviation values for mean roughness (Rz) before and after; Difference between means and P value (before and after) – GoldF ML Multilayer

Polishing	Before – Mean ± SD	After – Mean ± SD	Mean Difference	P value (Before - After)
EVE Diacera (DA)	3.33 ± 0.269	0.736 ± 0.157	2.5966	< 0.001
Excerapol (EX)	2.69 ± 0.486	1.22 ± 0.350	1.4689	< 0.001
Glaze (GL)	2.68 ± 0.468	0.506 ± 0.210	2.1714	< 0.001
Aluminum Paste (PA)	3.11 ± 0.594	1.61 ± 0.310	1.4933	< 0.001
Diamond Paste (PD)	3.46 ± 0.824	1.08 ± 0.342	2.3763	< 0.001

Performing a comparison of the final polyemnto results obtained, among the Ceramill samples, the GL polishing protocol resulted in the lowest roughness (0.078), together with the DA protocol, for Ra values. For GoldF ML Multilayer, the GL protocol again resulted in the lowest roughness (0.128), along with the DA and PD protocols, for Ra values. For Rz, the relationships were maintained for Ceramill, and were distinct for GoldF ML Multilayer, where GL and AD presented statistically lower values (Table 06).

Table 06 – Comparison of mean and standard deviation between the polishing protocols within it for Ra and Rz; Comparison of mean and standard deviation between ceramic deferents in the same polishing protocol for Ra and Rz.

Average roughness (Ra)					
	EVE Diacera (DA)	**Excerapol (EX)**	**Aluminum Paste (PA)**	**Diamond Paste (PD)**	**Glaze (GL)**
Ceramil	0,113 ± 0,025Ba	0,369 ± 0,106Aa	0,373 ± 0,068Aa	0,322 ± 0,111Aa	0,078 ± 0,027Ba
GoldF ML Multilayer	0,152 ± 0,035BCa	0,245 ± 0,096ABb	0,314 ± 0,060Aa	0,213 ± 0,060ACb	0,128 ± 0,051Ca
Average roughness (Rz)					
	EVE Diacera (DA)	**Excerapol (EX)**	**Aluminum Paste (PA)**	**Diamond Paste (PD)**	**Glaze (GL)**
Ceramil	0,610 ± 0,132Ba	1,796 ± 0,476Aa	1,992 ± 0,404Aa	1,595 ± 0,522Aa	0,304 ± 0,091Ba
GoldF ML Multilayer	0,736 ± 0,157CDa	1,225 ± 0,350ABb	1,615 ± 0,310Ab	1,082 ± 0,342BCb	0,506 ± 0,210Da

Capital letters refer to the differences between polishing protocols within the same ceramic; Lowercase letters refer to the differences between the ceramics within each polishing protocol.

Table 6 shows that Ceramil showed greater uniformity of surface behavior compared to GoldF ML Multilayer. The images in scanning electron microsopia corroborate the roughness data, showing that all protocols provided a decrease in roughness and evidences some surface defects (Figure 01).

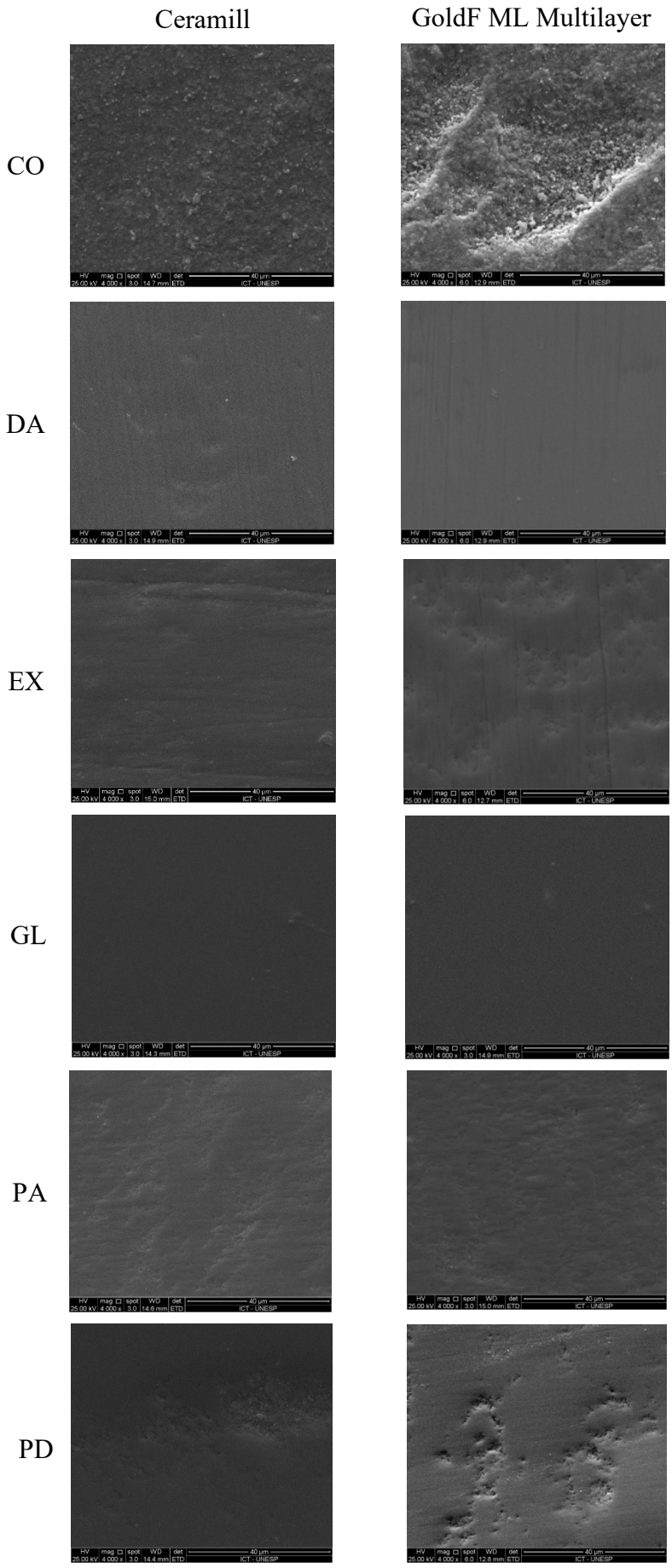


Figure 01-Surface morphological aspect of groups CO, DA, EX GL, PA and PD for Ceramill and GoldF ML Multilayer ceramics, in 4000x.

Discussion

It was possible to verify that all protocols had effects on the surface morphology of the samples, evidencing a significant decrease in the mean values of roughness after polishing in all groups. As evidenced in the scanning electron microscopy images, an increase in superficial smoothness could be observed after the polishing protocols.

Zirconia has high hardness (H_V 1,160–1,300), but lower than alumina (H_V 1,800–2,200) and diamond (H_V 10,200). Thus, they can be processed by instruments coated with abrasive diamond grains[9]. The most used forms for zirconia polishing are rubbers containing high-density diamond abrasives, represented in the present study by the DA and EX groups, and pastes containing diamond grains and other fine oxides, represented by PA and PD. The results showed better results for AD, if we consider both ceramics tested.

Glaze is considered the gold standard for ceramic polishing[10], but it was possible to verify that other protocols achieved similar effects on surface roughness, according to DA for Ceramil and DA and PD for GoldF ML Multilayer. It should be noted that even the groups that presented higher values of roughness EX, BP and PD, also provided significant improvements in relation to the CO group.

Considering that the load conditions were standardized for all samples, these findings can be justified by the polishing time[11,12]. Considering that the time was standardized for all samples, further studies would be needed to verify the ideal time for the different protocols to reach similar standards. But the findings of the present study suggest advantages for the AD protocol, regardless of the ceramics. If we consider that this provided less surface roughness in less time and eliminates the need for the laboratory step, present in GL. With this, it is possible to propose new studies that evaluate the increase in polishing time of each group, in addition to the possibility of studying the combination of protocols.

It is important to emphasize that the zirconia roughening was performed before

sinterization, aiming to reduce energy and material consumption, as well as enabling better control over the technician's movements and force. If roughening were to be done after sinterization, it would require the use of multiple diamond burs, a challenging standardization of movements, and a higher expenditure of energy and time.

Another point to be highlighted is that the construction of the more uniform zirconia block may have directly impacted the roughness reduction results, since the Ceramil samples had a more uniform surface than the GoldF ML Multilayer samples. This uniformity can be seen by the mean roughness values and scanning electron microscopy images of the CO group, where Ceramil presented a thinner and more homogeneous microstructural aspect.

Considering that Ceramil presented mean values of roughness before polishing higher than the values of GoldF MT Multilayer, and that it reached similar values after the polishing protocols for all groups, except EX and PD, we can infer that the polishing protocols presented more favorable behavior for Ceramill. This finding may be directly related to the microstructure of the ceramics studied, with regard to the difference and conformity of the grains[13], but this was not the object of analysis in the present study.

The wear of the opposite teeth is another issue of great clinical relevance[14,15,16]. Recent studies on the wear of the antagonist enamel have demonstrated that the proper surface finish of zirconia resulted in less enamel wear[17,18,19]. These results suggest that the wear of the antagonist enamel is significantly affected by the degree of surface finish. Given this scenario, the potential use of alternative polishing techniques to glaze, such as the DA technique, is of great relevance. Some studies report that glazed zirconia has greater wear loss than polished zirconia. Although the surface of vitrified zirconia is smooth before the wear test, after function, this layer is lost and consequently a rough surface appears, which can act aggressively as an abrasive surface[17,18]. The enamel loss generated by polished zirconia was significantly lower than in glazeated zirconias[17,19].

Considering the growing adoption of zirconia as a restorative material in dentistry[1], the present study showed that there may be alternatives to glaze, and it is important to know the effects of the polishing protocols already available in the market, which brings safety and agility to the clinical day-to-day.

It is not yet possible to state whether the manufacturing time, storage mode or even the difference in manufacturing batches of each zirconia block may have influenced the results. New studies involving the analysis of the interferences of the superficial morphological characteristics in the optical, mechanical and biological aspects should be performed, in order to assist the professional in the clinical decision of which polishing protocol to employ.

Conclusion

The surface polishing protocols showed differences in the morphology and roughness of the analyzed samples. Some polishing protocols may differ according to zirconia.

References

1. Esquivel-Upshaw, J F et al. Randomized clinical study of wear of enamel antagonists against polished monolithic zirconia crowns. Journal of dentistry vol. 68 (2018): 19-27. Disponível em: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5828514> Acesso em: 20 dez 2020.
2. Ghodsi S, Jafarian Z. A Review on Translucent Zirconia. Eur J Prosthodont Restor Dent. 2018 May 30;26(2):62-74. doi: 10.1922/EJPRD_01759Ghodsi13. PMID: 29797847.
3. Kontonasaki E, Rigos AE, Ilia C, Istantsos T. Monolithic Zirconia: An Update to Current Knowledge. Optical Properties, Wear, and Clinical Performance. Dent J (Basel). 2019 Sep 2;7(3):90. doi: 10.3390/dj7030090. PMID: 31480688; PMCID: PMC6784470.> Acesso em 20 dez 2020.
4. Habibi, Yasamin & Dawid, Marie-Theres & Waldecker, Moritz & Rammelsberg, Peter & Bömicke, Wolfgang. (2020). Three-year clinical performance of monolithic and partially veneered zirconia ceramic fixed partial dentures. Journal of Esthetic and Restorative Dentistry. 32. 10.1111/jerd.12568.
5. Öztürk C, Can G. Effect of sintering parameters on the mechanical properties of monolithic zirconia. J Dent Res Dent Clin Dent Prospects. 2019 Fall;13(4):247-252. doi: 10.15171/joddd.2019.038. PMID: 32190207; PMCID: PMC7072090.
6. Donovan, Terry & Abd Al-Raheam, Islam & Sulaiman, Taiseer. (2018). An evidence-based evaluation of contemporary dental ceramics. Dental Update. 45. 541-546. 10.12968/denu.2018.45.6.541.
7. Dal Piva A, Contreras L, Ribeiro FC, Anami LC, Camargo S, Jorge A, Bottino MA. Monolithic Ceramics: Effect of Finishing Techniques on Surface Properties, Bacterial Adhesion and Cell Viability. Oper Dent. 2018 May/Jun;43(3):315-325. doi: 10.2341/17-011-L. Epub 2018 Mar 13. PMID: 29533718.
8. The jamovi project (2021). jamovi. (Version 2.2) [Computer Software]. Retrieved from https://www.jamovi.org.
9. Miyazaki T, Nakamura T, Matsumura H, Ban S, Kobayachi T. Current status of zirconia restoration J. Prosthodont. Res. 2013, 57(4):236-261, 10.1016/j.jpor.2013.09.001
10. Silva TM, Salvia AC, Carvalho RF, Pagani C, Rocha DM, Silva EG. Polishing for glass ceramics: which protocol? J Prosthodont Res. 2014 Jul;58(3):160-70. doi: 10.1016/j.jpor.2014.02.001. Epub 2014 Mar 28. PMID: 24684959.
11. Heintze SD, Forjanic M, Rousson V. Surface roughness and gloss of dental materials as a function of force and polishing time in vitro. Dent Mater. 2006 Feb;22(2):146-65. doi: 10.1016/j.dental.2005.04.013. Epub 2005 Aug 9. PMID: 16084582.
12. Silva, Tânia Mara da et al. Effects of Different Polishing Protocols on Lithium Disilicate Ceramics. Brazilian Dental Journal [online]. 2015, v. 26, n. 5 [Accessed 17 October 2021] , pp. 478-483. Available from: <https://doi.org/10.1590/0103-6440201300370>. Epub Oct 2015. ISSN 1806-4760. https://doi.org/10.1590/0103-6440201300370.
13. Lucas TJ, Lawson NC, Janowski GM, Burgess JO. Effect of grain size on the monoclinic transformation, hardness, roughness, and modulus of aged partially stabilized zirconia. Dent Mater. 2015 Dec;31(12):1487-92. doi: 10.1016/j.dental.2015.09.014. Epub

2015 Oct 17. PMID: 26490101.
14. Paolo V, Mutinelli S. Evaluation of zirconium-oxide-based ceramic single-unit posteriorfixed dental prostheses (FDPs) generated with two CAD/CAM systems compared to porcelain-fused-to-metal single-unit posterior FDPs: A 5-year clinical prospective study J Prosthodon. 2012; 21:265-269.
15. Roediger M, Gersdorff N, Huels A, Rinke S. Prospective evaluation of zirconia posterior fixed partial dentures: four-year clinical results Int J Prosthodont. 2010; 23:141-148.
16. Örtorp A, Kihl ML, Carlsson GE. A 5-year retrospective study of survival of zirconia single crowns fitted in a private clinical setting J Dent 2012; 40:527-530.
17. Jung YS, Lee JW, Choi YJ, Ahn JS, Shin SW, Huh JB. A study on the in-vitro wear of the natural tooth structure by opposing zirconia or dental porcelain J Adv Prosthodont. 2010; 2:1111-1115.
18. Kontos L, Schille C, Schweizer E, Geis-Gerstorfer J. Influence of surface treatment on the wear of solid zirconia Acta Odontol Scand. 2013; 71:482-487.
19. Albashaireh ZSM, Ghazal M, Kern M. Two-body wear of different ceramic materials opposed to zirconia ceramic J Prosthet Dent. 2010; 104:105-113.
20. Lima Júnior, D. A. de .; Nogueira Filho, R.; Batista, M. R. A. de J. .; Couto, G. A. S. do .; Lima, D. M. .; Firoozmand, L. M. . **What is the importance of finishing and polishing in direct composite resin restorations in anterior teeth?** . Research, Society and Development, [S. l.], v. 11, n. 12, p. e535111234561, 2022. DOI: 10.33448/rsd-v11i12.34561. Disponível em: https://rsdjournal.org/index.php/rsd/article/view/34561. Acesso em: 28 dec. 2023.

3 CONCLUSÃO

Os protocolos de polimento de superfície apresentaram diferenças na morfologia e rugosidade das amostras analisadas. Alguns protocolos de polimento podem apresentar diferenças de acordo com a zircônia.

REFERÊNCIAS

Silva, Tânia Mara da et al. **Effects of Different Polishing Protocols on Lithium Disilicate Ceramics**. Brazilian Dental Journal [online]. 2015, v. 26, n. 5 [Accessed 17 October 2021] , pp. 478-483. Available from: <https://doi.org/10.1590/0103-6440201300370>. Epub Oct 2015. ISSN 1806-4760. https://doi.org/10.1590/0103-6440201300370.

Esquivel-Upshaw, J F et al. **Randomized clinical study of wear of enamel antagonists against polished monolithic zirconia crowns**. *Journal of dentistry* vol. 68 (2018): 19-27. Disponível em: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5828514> Acesso em: 20 dez 2020.

Altan, B; Cinar, S; Tuncelli, B. **Evaluation of shear bond strength of zirconia-based monolithic CAD-CAM materials to resin cement after different surface treatments. Disponível em:** https://www.njcponline.com/article.asp?issn=11193077;year=2019;volume=22;issue=11;spage=1475;epage=1482;aulast=Altan> Acesso em 20 dez 2020.

Kontonasaki, Eleana; E. Rigos, Athanasios; ILIA, Charithea; ISTANTSOS, Thomas. **Monolithic Zirconia: An Update to Current Knowledge. Optical Properties, Wear, and Clinical Performance.** Disponível em: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6784470/> Acesso em 20 dez 2020.

Habibi, Yasamin & Dawid, Marie-Theres & Waldecker, Moritz & Rammelsberg, Peter & Bömicke, Wolfgang. (2020). **Three-year clinical performance of monolithic and partially veneered zirconia ceramic fixed partial dentures**. Journal of Esthetic and Restorative Dentistry. 32. 10.1111/jerd.12568.

Öztürk C, Can G. **Effect of sintering parameters on the mechanical properties of monolithic zirconia. J Dent Res Dent Clin Dent Prospects**. 2019 Fall;13(4):247-252. doi: 10.15171/joddd.2019.038. PMID: 32190207; PMCID: PMC7072090.

Donovan, Terry & Abd Al-Raheam, Islam & Sulaiman, Taiseer. (2018). **An evidence-based evaluation of contemporary dental ceramics. Dental Update**. 45. 541-546. 10.12968/denu.2018.45.6.541.

Pekkan G, Pekkan K, Bayindir BÇ, Özcan M, Karasu B. **Factors affecting the translucency of monolithic zirconia ceramics: A review from materials science perspective**. Dent Mater J. 2020 Jan 31;39(1):1-8. doi: 10.4012/dmj.2019-098. Epub 2019 Aug 10. PMID: 31406098.

Ghodsi S, Jafarian Z. **A Review on Translucent Zirconia.** Eur J Prosthodont Restor Dent. 2018 May 30;26(2):62-74. doi: 10.1922/EJPRD_01759Ghodsi13. PMID: 29797847

Dal Piva A, Contreras L, Ribeiro FC, Anami LC, Camargo S, Jorge A, Bottino MA. **Monolithic Ceramics: Effect of Finishing Techniques on Surface Properties,**

Bacterial Adhesion and Cell Viability. Oper Dent. 2018 May/Jun;43(3):315-325. doi: 10.2341/17-011-L. Epub 2018 Mar 13. PMID: 29533718.

Miyazaki T, Nakamura T, Matsumura H, Ban S, Kobayachi T. **Current status of zirconia restoration** J. Prosthodont. Res. 2013, 57(4):236-261, 10.1016/j.jpor.2013.09.001

Silva TM, Salvia AC, Carvalho RF, Pagani C, Rocha DM, Silva EG. **Polishing for glass ceramics: which protocol?** J Prosthodont Res. 2014 Jul;58(3):160-70. doi: 10.1016/j.jpor.2014.02.001. Epub 2014 Mar 28. PMID: 24684959.

Heintze SD, Forjanic M, Rousson V. **Surface roughness and gloss of dental materials as a function of force and polishing time in vitro.** Dent Mater. 2006 Feb;22(2):146-65. doi: 10.1016/j.dental.2005.04.013. Epub 2005 Aug 9. PMID: 16084582.

Lucas TJ, Lawson NC, Janowski GM, Burgess JO. **Effect of grain size on the monoclinic transformation, hardness, roughness, and modulus of aged partially stabilized zirconia.** Dent Mater. 2015 Dec;31(12):1487-92. doi: 10.1016/j.dental.2015.09.014. Epub 2015 Oct 17. PMID: 26490101.

Paolo V, Mutinelli S. **Evaluation of zirconium-oxide-based ceramic single-unit posteriorfixed dental prostheses (FDPs) generated with two CAD/CAM systems compared to porcelain-fused-to-metal single-unit posterior FDPs: A 5-year clinical prospective study** J Prosthodon. 2012; 21:265-269.

Roediger M, Gersdorff N, Huels A, Rinke S. **Prospective evaluation of zirconia posterior fixed partial dentures: four-year clinical results** Int J Prosthodont. 2010; 23:141-148.

Örtorp A, Kihl ML, Carlsson GE. **A 5-year retrospective study of survival of zirconia single crowns fitted in a private clinical setting** J Dent 2012; 40:527-530.

Jung YS, Lee JW, Choi YJ, Ahn JS, Shin SW, Huh JB. **A study on the in-vitro wear of the natural tooth structure by opposing zirconia or dental porcelain** J Adv Prosthodont. 2010; 2:1111-1115.

Kontos L, Schille C, Schweizer E, Geis-Gerstorfer J. **Influence of surface treatment on the wear of solid zirconia** Acta Odontol Scand. 2013; 71:482-487.

Albashaireh ZSM, Ghazal M, Kern M. **Two-body wear of different ceramic materials opposed to zirconia ceramic** J Prosthet Dent. 2010; 104:105-113.

Lima Júnior, D. A. de .; Nogueira Filho, R.; Batista, M. R. A. de J. .; Couto, G. A. S. do .; Lima, D. M. .; Firoozmand, L. M. **. What is the importance of finishing and polishing in direct composite resin restorations in anterior teeth?** . Research, Society and Development, [S. l.], v. 11, n. 12, p. e535111234561, 2022. DOI: 10.33448/rsd-v11i12.34561. Disponível em: https://rsdjournal.org/index.php/rsd/article/view/34561. Acesso em: 28 dec. 2023.

ANEXO A - Instruções aos autores preconizadas pelo periódico Journal of Prosthetic Denstistry

JOURNAL OF PROSTHETIC DENTISTRY
The Official Publication for 24 Leading U.S. and International Prosthodontic Organizations

AUTHOR INFORMATION PACK

TABLE OF CONTENTS

ISSN: 0022-3913

DESCRIPTION

The Journal of Prosthetic Dentistry is the leading professional journal devoted exclusively to **prosthetic** and **restorative dentistry**. The *Journal* is the official publication for 24 leading U.S. international prosthodontic organizations. The monthly publication features timely, original peer-reviewed articles on the newest techniques, dental materials, and research findings. The *Journal* serves prosthodontists and dentists in advanced practice, and features color photos that illustrate many step-by-step procedures. *The Journal of Prosthetic Dentistry* is included in Index Medicus and CINAHL.

ABSTRACTING AND INDEXING

Scopus

EDITORIAL BOARD

GUIDE FOR AUTHORS

Instructions in Other languages

Spanish: 2013 Guía para la Preparación de ManuscritosTurkish: 2013 Makale Hazırlama RehberiPortuguese: 2013 Guia para a Preparação de Manuscritos

The Journal of Prosthetic Dentistry is the leading professional journal devoted exclusively to prosthetic and restorative dentistry. The Journal is the official publication of 24 leading U.S. and international prosthodontic organizations, serving prosthodontists and dentists in advanced practice. It features timely, original peer-reviewed articles on the newest techniques, dental materials, and research findings, with color photographs that illustrate step-by-step procedures. *The Journal of Prosthetic Dentistry* is included in Index Medicus and CINAHL.

Article Types

Articles are classified as one of the following: research/clinical science article, clinical report, technique article, systematic review, or tip from our readers. Required sections for each type of article are listed in the order in which they should be presented.

JPD Digital

JPD Digital is an exclusive video platform from *The Journal of Prosthetic Dentistry* featuring topics on prosthodontics and implants of interest to clinicians and dental technologists. If you have a new or special clinical or dental technique, an innovative surgical procedure, a unique patient treatment, or simply a presentation that summarizes an attractive topic; if you are eager to combine digital methods with modern information sources such as video, slideshows as video files and audio, please do not hesitate to contact us.
By submitting a video and summary to JPD Digital, you can allow your audience to look over your shoulder to get a close look at your work. In 2022, the launch year, JPD Digital published 8 videos, which have been viewed 5,000 times!

All JPD Digital submissions are fully indexed and citable.

View JPD Digital articles here: https://www.thejpd.org/video-do. Please contact the JPD Editorial Office at JPD@augusta.edu to learn more if you are interested in submitting an article for JPD Digital. All submissions to JPD Digital will be peer reviewed and subject to Editor approval.

Requirements for publication in JPD Digital include: Video of approximately 20-30 minutes in length submitted via email to to Dr. Jonathan Ferencz at JLFerencz@mac.com to be peer-reviewed and approved by the JPD Digital team A short, written summary (1-2 pages) to publish in the *Journal of Prosthetic Dentistry*, submitted via Editorial Manager. This summary is essential to enable the video to be searchable in PubMed and to direct readers to the video. The summary should include: Brief abstract Summary of video presentation 1-2 illustrations References Brief author bio One still image from the final video to use as the default image to display when it is not actively being played

JPD Digital Recording Instructions

The video content must be submitted as two separate tracks: The first consists of the visual component which includes video, still photos, illustrations, and text, but without narration. The second component consists of the narration with the speaker(s) standing in front of a green screen. This will enable our technical experts to precisely cut out the speaker and place him or her anywhere on the background which is the video presentation. Video recording instructions are located at the following link: https://www.elsevier.com/__data/promis_misc/jpd-digital-recording-instructions.pdf

Research and Education/Clinical Research

The research report should be no longer than 10-12 double-spaced, typed pages and be accompanied by no more than 12 high-quality illustrations. Avoid the use of outline form (numbered and/or bulleted sentences or paragraphs). The text should be written in complete sentences and paragraph form.

Abstract (approximately 400 words): Create a structured abstract with the following subsections: Statement of Problem, Purpose, Material and Methods, Results, and Conclusions. The abstract should contain enough detail to describe the experimental design and variables. Sample size, controls,

method of measurement, standardization, examiner reliability, and statistical method used with associated level of significance should be described in the Material and Methods section. Actual values should be provided in the Results section.

Clinical Implications: In 2-4 sentences, describe the impact of the study results on clinical practice.

Introduction: Explain the problem completely and accurately. Summarize relevant literature, and identify any bias in previous studies. Clearly state the objective of the study and the research hypothesis at the end of the Introduction. Please note that, for a thorough review of the literature, most (if not all references) should first be cited in the Introduction and/or Material and Methods section.

Material and Methods: In the initial paragraph, provide an overview of the experiment. Provide complete manufacturing information for all products and instruments used, either in parentheses or in a table. Describe what was measured, how it was measured, and the units of measure. List criteria for quantitative judgment. Describe the experimental design and variables, including defined criteria to control variables, standardization of testing, allocation of specimens/subjects to groups (specify method of randomization), total sample size, controls, calibration of examiners, and reliability of instruments and examiners. State how sample sizes were determined (such as with power analysis). Avoid the use of group numbers to indicate groups. Instead, use codes or abbreviations that will more clearly indicate the characteristics of the groups and will therefore be more meaningful for the reader. Statistical tests and associated significance levels should be described at the end of this section.

Results: Report the results accurately and briefly, in the same order as the testing was described in the Material and Methods section. For extensive listings, present data in tabular or graphic form to help the reader. For a 1-way ANOVA report of, F and P values in the appropriate location in the text. For all other ANOVAs, per guidelines, provide the ANOVA table(s). Describe the most significant findings and trends. Text, tables, and figures should not repeat each other. Results noted as significant must be validated by actual data and P values.

Discussion: Discuss the results of the study in relation to the hypothesis and to relevant literature. The Discussion section should begin by stating whether or not the data support rejecting the stated null hypothesis. If the results do not agree with other studies and/or with accepted opinions, state how and why the results differ. Agreement with other studies should also be stated. Identify the limitations of the present study and suggest areas for future research.

Conclusions: Concisely list conclusions that may be drawn from the research; do not simply restate the results. The conclusions must be pertinent to the objectives and justified by the data. In most situations, the conclusions are true for only the population of the experiment. All statements reported as conclusions should be accompanied by statistical analyses.

*References:*See Reference Guidelines and Sample References page.

Tables: See Table Guidelines.

Illustrations: See Figure Submission and Sample Figures page.

Clinical Report

The clinical report describes the author's methods for meeting a patient treatment challenge. It should be no longer than 4 to 5 double-spaced, pages and be accompanied by no more than 8 high-quality illustrations. In some situations, the Editor may approve the publication of additional figures if they contribute significantly to the manuscript.

Abstract: Provide a short, nonstructured, 1-paragraph abstract that briefly summarizes the problem encountered and treatment administered.

Introduction: Summarize literature relevant to the problem encountered. Include references to standard treatments and protocols. Please note that most, if not all, references should first be cited in the Introduction and/or Clinical Report section.

Clinical Report: Describe the patient, the problem with which he/she presented, and any relevant medical or dental background. Describe the various treatment options and the reasons for selection of the chosen treatment. Fully describe the treatment rendered, the length of the follow-up period, and any improvements noted as a result of treatment. This section should be written in past tense and in paragraph form.

Discussion: Comment on the advantages and disadvantages of the chosen treatment and describe any contraindications for it. If the text will only be repetitive of previous sections, omit the Discussion.

Summary: Briefly summarize the patient treatment.

References: See Reference Guidelines and Sample References page.

Illustrations: See Figure Submission and Sample Figures page.

Dental Technique

The dental technique article presents, in a step-by-step format, a unique procedure helpful to dental professionals. It should be no longer than 4 to 5 double-spaced, typed pages and be accompanied by no more than 8 high-quality illustrations. In some situations, the Editor may approve the publication of additional figures if they contribute significantly to the manuscript.

Abstract: Provide a short, nonstructured, 1-paragraph abstract that briefly summarizes the technique.

Introduction: Summarize relevant literature. Include references to standard methods and protocols. Please note that most, if not all, references should first be cited in the Introduction and/or Technique section.

Technique: In a numbered, step-by-step format, describe each step of the technique. The text should be written in command rather than descriptive form (?Survey the diagnostic cast? rather than ?The diagnostic cast is surveyed.?) Include citations for the accompanying illustrations.

Discussion: Comment on the advantages and disadvantages of the technique, indicate the situations to which it may be applied, and describe any contraindications for its use. Avoid excessive claims of effectiveness. If the text will only be repetitive of previous sections, omit the Discussion.

Summary: Briefly summarize the technique presented and its chief advantages.

References: See Reference Guidelines and Sample References page

Illustrations: See Figure Submission and Sample Figures page.

Systematic Review

The author is advised to develop a systematic review in the Cochrane style and format. The *Journal* has transitioned away from literature reviews to systematic reviews. For more information on systematic reviews, please see www.cochrane.org. An example of a Journal systematic review: Torabinejad M, Anderson P, Bader J, Brown LJ, Chen LH, Goodacre CJ, Kattadiyil MT, Kutsenko D, Lozada J, Patel R, Petersen F, Puterman I, White SN. Outcomes of root canal treatment and restoration, implant-supported single crowns, fixed partial dentures, and extraction without replacement: a systematic review. J Prosthet Dent 2007;98:285-311.

The systematic review consists of:

An Abstract using a structured format (Statement of Problem, Purpose, Material and Methods, Results, Conclusions).

Text of the review consisting of an introduction (background and objective), methods (selection criteria, search methods, data collection and data analysis), results (description of studies, methodological quality, and results of analyses), discussion, authors' conclusions, acknowledgments, and conflicts of interest. References should be peer reviewed and follow JPD format.

Tables and figures, if necessary, showing characteristics of the included studies, specification of the interventions that were compared, the results of the included studies, a log of the studies that were excluded, and additional tables and figures relevant to the review.

Tips From Our Readers

Tips are brief reports on helpful or timesaving procedures. They should be limited to 2 authors, no longer than 250 words, and include no more than 2 high quality illustrations. Describe the procedure in a numbered, step-by-step format; write the text in command rather than descriptive or passive form ("Survey the diagnostic cast" rather than "The diagnostic cast is surveyed").

Contact Information

The Journal of Prosthetic Dentistry
Editorial Office
The Journal of Prosthetic Dentistry
The Dental College of Georgia at Augusta University
1120 15th St., GC3094
Augusta, GA 30912-1255
Phone: (706) 721-4558
E-mail: JPD@augusta.edu
Website: http://www.prosdent.org
Online submission: https://www.editorialmanager.com/JPD/default.aspx

BEFORE YOU BEGIN

Submission Guidelines

Thank you for your interest in writing an article for *The Journal of Prosthetic Dentistry*. In publishing, as in dentistry, precise procedures are essential. Your attention to and compliance with the following policies will help ensure the timely processing of your submission.

Length of Manuscripts
Manuscript length depends on manuscript type. In general, research and clinical science articles should not exceed 10 to 12 double-spaced, typed pages (excluding references, legends, and tables). Clinical Reports and Technique articles should not exceed 4 to 5 pages, and Tips articles should not exceed 1 to 2 pages. The length of systematic reviews varies.

Number of Authors
The number of authors is limited to 4; the inclusion of more than 4 *must be justified* in the letter of submission. (Each author's contribution must be listed.) Otherwise, contributing authors in excess of 4 will be listed in the Acknowledgments. There can only be one corresponding author.

General Formatting
All submissions must be submitted via the Editorial Manager system in Microsoft Word with an 8.5×11 inch page size. The following specifications should also be followed:
Times Roman, 12 ptDouble-spacedLeft-justifiedNo space between paragraphs1-inch margins on all sidesHalf-inch paragraph indentsHeaders/Footers should be clear of page numbers or other informationHeadings are upper case bold, and subheads are upper/lower case bold. No italics are used.References should not be automatically numbered. Endnote or other reference-generating programs should be turned off.Set the Language feature in MS Word to English (US). Also change the language to English (US) in the style named Balloon Text.

Ethics in publishing

Please see our information on Ethics in publishing.

Informed consent and patient details

Studies on patients or volunteers require ethics committee approval and informed consent, which should be documented in the paper. Appropriate consents, permissions and releases must be obtained where an author wishes to include case details or other personal information or images of patients and any other individuals in an Elsevier publication. Written consents must be retained by the author but copies should not be provided to the journal. Only if specifically requested by the journal in exceptional circumstances (for example if a legal issue arises) the author must provide copies of the

consents or evidence that such consents have been obtained. For more information, please review the Elsevier Policy on the Use of Images or Personal Information of Patients or other Individuals. Unless you have written permission from the patient (or, where applicable, the next of kin), the personal details of any patient included in any part of the article and in any supplementary materials (including all illustrations and videos) must be removed before submission.

Declaration of interest

All authors must disclose any financial and personal relationships with other people or organizations that could inappropriately influence (bias) their work. Examples of potential competing interests include employment, consultancies, stock ownership, honoraria, paid expert testimony, patent applications/registrations, and grants or other funding. Authors must disclose any interests in two places: 1. A summary declaration of interest statement in the title page file (if double anonymized) or the manuscript file (if single anonymized). If there are no interests to declare then please state this: 'Declarations of interest: none'. 2. Detailed disclosures as part of a separate Declaration of Interest form, which forms part of the journal's official records. It is important for potential interests to be declared in both places and that the information matches. More information.

Declaration of generative AI in scientific writing

The below guidance only refers to the writing process, and not to the use of AI tools to analyse and draw insights from data as part of the research process.

Where authors use generative artificial intelligence (AI) and AI-assisted technologies in the writing process, authors should only use these technologies to improve readability and language. Applying the technology should be done with human oversight and control, and authors should carefully review and edit the result, as AI can generate authoritative-sounding output that can be incorrect, incomplete or biased. AI and AI-assisted technologies should not be listed as an author or co-author, or be cited as an author. Authorship implies responsibilities and tasks that can only be attributed to and performed by humans, as outlined in Elsevier's AI policy for authors.

Authors should disclose in their manuscript the use of AI and AI-assisted technologies in the writing process by following the instructions below. A statement will appear in the published work. Please note that authors are ultimately responsible and accountable for the contents of the work.

Disclosure instructions
Authors must disclose the use of generative AI and AI-assisted technologies in the writing process by adding a statement at the end of their manuscript in the core manuscript file, before the References list. The statement should be placed in a new section entitled 'Declaration of Generative AI and AI-assisted technologies in the writing process'.

Statement: During the preparation of this work the author(s) used [NAME TOOL / SERVICE] in order to [REASON]. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

This declaration does not apply to the use of basic tools for checking grammar, spelling, references etc. If there is nothing to disclose, there is no need to add a statement.

Submission declaration and verification

Submission of an article implies that the work described has not been published previously (except in the form of an abstract, a published lecture or academic thesis, see 'Multiple, redundant or concurrent publication' for more information), that it is not under consideration for publication elsewhere, that its publication is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out, and that, if accepted, it will not be published elsewhere in the same form, in English or in any other language, including electronically without the written consent of the copyright-holder. To verify compliance, your article may be checked by Crossref Similarity Check and other originality or duplicate checking software.

Use of inclusive language

Inclusive language acknowledges diversity, conveys respect to all people, is sensitive to differences, and promotes equal opportunities. Content should make no assumptions about the beliefs or commitments of any reader; contain nothing which might imply that one individual is superior to another on the grounds of age, gender, race, ethnicity, culture, sexual orientation, disability or health condition; and use inclusive language throughout. Authors should ensure that writing is free from bias,

stereotypes, slang, reference to dominant culture and/or cultural assumptions. We advise to seek gender neutrality by using plural nouns ("clinicians, patients/clients") as default/wherever possible to avoid using "he, she," or "he/she." We recommend avoiding the use of descriptors that refer to personal attributes such as age, gender, race, ethnicity, culture, sexual orientation, disability or health condition unless they are relevant and valid. When coding terminology is used, we recommend to avoid offensive or exclusionary terms such as "master", "slave", "blacklist" and "whitelist". We suggest using alternatives that are more appropriate and (self-) explanatory such as "primary", "secondary", "blocklist" and "allowlist". These guidelines are meant as a point of reference to help identify appropriate language but are by no means exhaustive or definitive.

Reporting sex- and gender-based analyses

Reporting guidance

For research involving or pertaining to humans, animals or eukaryotic cells, investigators should integrate sex and gender-based analyses (SGBA) into their research design according to funder/sponsor requirements and best practices within a field. Authors should address the sex and/or gender dimensions of their research in their article. In cases where they cannot, they should discuss this as a limitation to their research's generalizability. Importantly, authors should explicitly state what definitions of sex and/or gender they are applying to enhance the precision, rigor and reproducibility of their research and to avoid ambiguity or conflation of terms and the constructs to which they refer (see Definitions section below). Authors can refer to the Sex and Gender Equity in Research (SAGER) guidelines and the SAGER guidelines checklist. These offer systematic approaches to the use and editorial review of sex and gender information in study design, data analysis, outcome reporting and research interpretation - however, please note there is no single, universally agreed-upon set of guidelines for defining sex and gender.

Definitions

Sex generally refers to a set of biological attributes that are associated with physical and physiological features (e.g., chromosomal genotype, hormonal levels, internal and external anatomy). A binary sex categorization (male/female) is usually designated at birth ("sex assigned at birth"), most often based solely on the visible external anatomy of a newborn. Gender generally refers to socially constructed roles, behaviors, and identities of women, men and gender-diverse people that occur in a historical and cultural context and may vary across societies and over time. Gender influences how people view themselves and each other, how they behave and interact and how power is distributed in society. Sex and gender are often incorrectly portrayed as binary (female/male or woman/man) and unchanging whereas these constructs actually exist along a spectrum and include additional sex categorizations and gender identities such as people who are intersex/have differences of sex development (DSD) or identify as non-binary. Moreover, the terms "sex" and "gender" can be ambiguous—thus it is important for authors to define the manner in which they are used. In addition to this definition guidance and the SAGER guidelines, the resources on this page offer further insight around sex and gender in research studies.

Author contributions

For transparency, we require corresponding authors to provide co-author contributions to the manuscript using the relevant CRediT roles. The CRediT taxonomy includes 14 different roles describing each contributor's specific contribution to the scholarly output. The roles are: Conceptualization; Data curation; Formal analysis; Funding acquisition; Investigation; Methodology; Project administration; Resources; Software; Supervision; Validation; Visualization; Roles/Writing - original draft; and Writing – review & editing. Note that not all roles may apply to every manuscript, and authors may have contributed through multiple roles. More details and an example.

Changes to authorship

Authors are expected to consider carefully the list and order of authors **before** submitting their manuscript and provide the definitive list of authors at the time of the original submission. Any addition, deletion or rearrangement of author names in the authorship list should be made only **before** the manuscript has been accepted and only if approved by the Journal Editor. To request such a change, the Editor must receive the following from the **corresponding author**: (a) the reason for the change in author list and (b) written confirmation (e-mail, letter) from all authors that they agree with the addition, removal or rearrangement. In the case of addition or removal of authors, this includes confirmation from the author being added or removed.

Only in exceptional circumstances will the Editor consider the addition, deletion or rearrangement of authors **after** the manuscript has been accepted. While the Editor considers the request, publication of the manuscript will be suspended. If the manuscript has already been published in an online issue, any requests approved by the Editor will result in a corrigendum.

Copyright

Upon acceptance of an article, authors will be asked to complete a 'Journal Publishing Agreement' (see more information on this). An e-mail will be sent to the corresponding author confirming receipt of the manuscript together with a 'Journal Publishing Agreement' form or a link to the online version of this agreement.

Subscribers may reproduce tables of contents or prepare lists of articles including abstracts for internal circulation within their institutions. Permission of the Publisher is required for resale or distribution outside the institution and for all other derivative works, including compilations and translations. If excerpts from other copyrighted works are included, the author(s) must obtain written permission from the copyright owners and credit the source(s) in the article. Elsevier has preprinted forms for use by authors in these cases.

For gold open access articles: Upon acceptance of an article, authors will be asked to complete a 'License Agreement' (more information). Permitted third party reuse of gold open access articles is determined by the author's choice of user license.

Author rights

As an author you (or your employer or institution) have certain rights to reuse your work. More information.

Elsevier supports responsible sharing

Find out how you can share your research published in Elsevier journals.

Role of the funding source

You are requested to identify who provided financial support for the conduct of the research and/or preparation of the article and to briefly describe the role of the sponsor(s), if any, in study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the article for publication. If the funding source(s) had no such involvement, it is recommended to state this.

Open access

Please visit our Open Access page for more information.

Language (usage and editing services)

Please write your text in good American English. Authors who feel their English language manuscript may require editing to eliminate possible grammatical or spelling errors and to conform to correct scientific English may wish to use the English Language Editing service available from Elsevier's WebShop https://webshop.elsevier.com/language-editing/ or visit our customer support site https://service.elsevier.com for more information.

Submission

Our online submission system guides you stepwise through the process of entering your article details and uploading your files. The system converts your article files to a single PDF file used in the peer-review process. Editable files (e.g., Word, LaTeX) are required to typeset your article for final publication. All correspondence, including notification of the Editor's decision and requests for revision, is sent by e-mail.

Submit your article

Please submit your article via https://www.editorialmanager.com/JPD/default.aspx.

PREPARATION

Use of word processing software

It is important that the file be saved in the native format of the MS Word program. The text should be in single-column format. Keep the layout of the text as simple as possible. Most formatting codes will be removed and replaced on processing the article. In particular, do not use the word processor's options to justify text or to hyphenate words. However, do use bold face, italics, subscripts, superscripts etc. When preparing tables, if you are using a table grid, use only one grid for each individual table and

not a grid for each row. If no grid is used, use tabs, not spaces, to align columns. The electronic text should be prepared in a way very similar to that of conventional manuscripts (see also the Guide to Publishing with Elsevier: https://www.elsevier.com/guidepublication). Note that source files of figures, tables and text graphics will be required whether or not you embed your figures in the text. See also the section on Electronic artwork.

To avoid unnecessary errors you are strongly advised to use the 'spell-check' and 'grammar-check' functions of your word processor.

Math formulae

Please submit math equations as editable text and not as images. Present simple formulae in line with normal text where possible and use the solidus (/) instead of a horizontal line for small fractional terms, e.g., X/Y. In principle, variables are to be presented in italics. Powers of e are often more conveniently denoted by exp. Number consecutively any equations that have to be displayed separately from the text (if referred to explicitly in the text).

Essential title page information

Title. Concise and informative. Titles are often used in information-retrieval systems. Avoid abbreviations and formulae. Trade names should not be used in the title.*Author names and affiliations.* Author's names should be complete first and last names. Where the family name may be ambiguous (e.g., a double name), please indicate this clearly. Present the authors' current title and affiliation, including the city and state/country of that affiliation. If it is private practice, indicate the city and state/country of the practice. Indicate all affiliations with a lower-case superscript letter immediately after the author's name and in front of the appropriate affiliation.*Corresponding author.* Clearly indicate who will handle correspondence at all stages of refereeing and publication, also post-publication. Ensure that phone numbers (with country and area code) are provided in addition to the e-mail address and the complete postal address. Contact details must be kept up to date by the corresponding author.

Title page format

Title: Capitalize only the first letter of the first word. Do not use any special formatting. Abbreviations or trade names should not be used. Trade names should not be used in the title.Authors: Directly under the title, type the names and academic degrees of the authors. Under the authors' names, provide the title, department and institutional names, city/state and country (unless in the U.S.) of each author. If necessary, provide the English translation of the institution. If the author is in private practice, indicate where with city/state/country. Link names and affiliations with a superscript letter (a,b,c,d). Presentation/support information and titles: If research was presented before an organized group, indicate name of the organization and location and date of the meeting. If work was supported by a grant or any other kind of funding, supply the name of the supporting organization and the grant number. Corresponding author: List the mailing address, business telephone, and e-mail address of the author who will receive correspondence. Acknowledgments: Indicate special thanks to persons or organizations involved with the manuscript. See Sample Title page.

Formatting of funding sources

List funding sources in this standard way to facilitate compliance to funder's requirements:

Funding: This work was supported by the National Institutes of Health [grant numbers xxxx, yyyy]; the Bill & Melinda Gates Foundation, Seattle, WA [grant number zzzz]; and the United States Institutes of Peace [grant number aaaa].

It is not necessary to include detailed descriptions on the program or type of grants and awards. When funding is from a block grant or other resources available to a university, college, or other research institution, submit the name of the institute or organization that provided the funding.

If no funding has been provided for the research, it is recommended to include the following sentence:

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Units

Follow internationally accepted rules and conventions: use the international system of units (SI). If other units are mentioned, please give their equivalent in SI.

Math formulae

Please submit math equations as editable text and not as images. Present simple formulae in line with normal text where possible and use the solidus (/) instead of a horizontal line for small fractional terms, e.g., X/Y. In principle, variables are to be presented in italics. Powers of e are often more conveniently denoted by exp. Number consecutively any equations that have to be displayed separately from the text (if referred to explicitly in the text).

Artwork

Figure Submission

JPD takes pride in publishing only the highest quality figures in its journal. All incoming figures must pass a thorough examination in Photoshop before the review process can begin. With more than 1,000 manuscripts submitted yearly, the manuscripts with few to no submission errors move through the system quickly. Figures that do not meet the guidelines will be sent back to the author for correction and moved to the bottom of the queue, creating a delay in the publishing process.

File Format

All figures should be submitted as TIF files or JPEG files only.

Image File Specifications

Figure dimensions must be 5.75 × 3.85 inches.

Figures should be size-matched (the same physical size) unless the image type prohibits size matching to other figures within the manuscript, as in the case of panoramic or periapical radiographs, SEM images, or graphs and screen shots. Do not "label" the faces of the figures with letters or numbers to indicate the order in which the figures should appear; such labels will be inserted during the publication process. Do not add wide borders to increase size.

Resolution

The figures should be of professional quality and high resolution. The following are resolution requirements:

Color and black-and-white photographs should be created and saved at 300 dots per inch (dpi).

Note: A 5.75 × 3.85-inch image at a resolution of 300 dpi will be approximately 6 megabytes. A figure of less than 300 dpi must not be increased artificially to 300 dpi; the resulting quality and resolution will be poor.

Line art or combination artwork (an illustration containing both line art and photograph) should be created and saved at a minimum of 600dpi.Clarity, contrast, and quality should be uniform among the parts of a multipart figure and among all of the figures within a manuscript.A uniform background of nontextured, medium blue should be provided for color figures when possible.

Text within Images

If text is to appear within the figure, labeled and unlabeled versions of the figures must be provided. Text appearing within the labeled versions of the figures should be in **Arial font and a minimum of 10 pt.** The text should be sized for readability if the figure is reduced for production in the Journal. Lettering should be in proportion to the drawing, graph, or photograph. A consistent font size should be used throughout each figure, and for all figures, Please note: Titles and captions should not appear within the figure file, but should be provided in the manuscript text (see Figure Legends).

If a key to an illustration requires artwork (screen lines, dots, unusual symbols), the key should be incorporated into the drawing instead of included in the typed legend. All symbols should be done professionally, be visible against the background, and be of legible proportion should the illustration be reduced for publication.

All microscopic photographs must have a measurement bar and unit of measurement on the image.

Color Figures

Generally, a maximum of 8 figures will be accepted for clinical report and dental technique articles, and 2 figures will be accepted for tips from our reader articles. However, the Editor may approve the publication of additional figures if they contribute significantly to the manuscript.

Clinical figures should be color balanced. Color images should be in CMYK (Cyan/Magenta/Yellow/Black) color format as opposed to RGB (Red/Green/Blue) color format.

Graphs/Screen Captures

Graphs should be numbered as figures, and the fill for bar graphs should be distinctive and solid; no shading or patterns. Thick, solid lines should be used and bold, solid lettering. Arial font is preferred. Place lettering on white background is preferred to reverse type (white lettering on a dark background). Line drawing should be a minimum of 600 dpi. Screen Captures should be a minimum of 300 dpi and as close to 5.75 and 3.85 as possible.

Composites

Composites are multiple images within one Figure file and, as a rule, are not accepted. They will be sent back to the author to replace them with each image sent separately as, Fig. 1A, Fig. 1B, Fig. 1C, etc. Each figure part must meet JPD Guidelines. (Some composite figures are more effective when submitted as one file. These files will be reviewed per case.) Contact the editorial office for more information about specific composites.

Figure Legends

The figure legends should appear within the text of the manuscript on a separate page after Tables and should appear under the heading FIGURES. Journal style requires that the articles (a, an, and the) are omitted from the figure legends. If an illustration is taken from previously published material, the legend must give full credit to the source (see Permissions).

File Naming

Each figure file must be numbered according to its position in the text (Figure 1, Figure 2, and so on) with Arabic numerals. The electronic image files must be named so that the figure number and format can be easily identified. For example, a Figure 1 in TIFF format should be named fig. 1.tif. Multipart figures must be clearly identifiable by the file names: Fig. 1A, Fig. 1B, Fig. 1C, Fig. 1-unlabeled, Fig. 1-labeled, etc.

Callouts

In the article, clearly reference each Figure and Table by including its number in parentheses at the end of the appropriate sentence before closing punctuation. For example: The sutures were removed after 3 weeks (Fig. 4). Or: are illustrated in Table 4.
The Journal reserves the right to standardize the format of graphs and tables.
Authors are obligated to disclose whether illustrations have been modified in any way.

Thumbnails
Place thumbnails (reduced size versions) of your figures in Figures section below each appropriate legend.
Thumbnails refers to placing a small (compressed file) copy of your figure into the FIGURES section of the manuscript after each appropriate legend. No smaller than 2" × 1.5" and approximately 72dpi. The goal is to give the editors/reviewers something to review but we want to keep the dimensions and the file size small for easy access. These small images are called thumbnails.

Figures Quick Checklist
All files are saved as TIFFs or JPEGs (only).Figure size: 5.75" × 3.85" (radiographs, SEMS, and screen captures may vary but they must all be size-matched). Figures are 300 dpi; line or combo line/photo illustrations are minimum 600 dpi.For text in figures use Ariel font.Label the Figure files according to their sequence in the text.Provide figure legends in the manuscript Figure section.Place thumbnails (small versions of figure files approx. 2" × 1.5") in Figure section below each legend.Submit composite figure parts as separate files.
A detailed guide to electronic artwork is available on our website: You are urged to visit this site; some excerpts from the detailed information about figure preparation are given here. https://www.elsevier.com/artworkinstructions.
Please make sure that artwork files are TIFFs and with the correct resolution. If, together with your accepted article, you submit usable color figures then Elsevier will ensure, at no additional charge, that these figures will appear in color online (e.g., ScienceDirect and other sites) in addition to color reproduction in print. For further information on the preparation of electronic artwork, please see https://www.elsevier.com/artworkinstructions.

Reference links
Increased discoverability of research and high quality peer review are ensured by online links to the sources cited. In order to allow us to create links to abstracting and indexing services, such as Scopus, Crossref and PubMed, please ensure that data provided in the references are correct. Please note that incorrect surnames, journal/book titles, publication year and pagination may prevent link creation. When copying references, please be careful as they may already contain errors. Use of the DOI is highly encouraged.

A DOI is guaranteed never to change, so you can use it as a permanent link to any electronic article. An example of a citation using DOI for an article not yet in an issue is: VanDecar J.C., Russo R.M., James D.E., Ambeh W.B., Franke M. (2003). Aseismic continuation of the Lesser Antilles slab beneath northeastern Venezuela. Journal of Geophysical Research, https://doi.org/10.1029/2001JB000884. Please note the format of such citations should be in the same style as all other references in the paper.

Data references
This journal encourages you to cite underlying or relevant datasets in your manuscript by citing them in your text and including a data reference in your Reference List. Data references should include the following elements: author name(s), dataset title, data repository, version (where available), year, and global persistent identifier. Add [dataset] immediately before the reference so we can properly identify it as a data reference. The [dataset] identifier will not appear in your published article.

Preprint references
Where a preprint has subsequently become available as a peer-reviewed publication, the formal publication should be used as the reference. If there are preprints that are central to your work or that cover crucial developments in the topic, but are not yet formally published, these may be referenced. Preprints should be clearly marked as such, for example by including the word preprint, or the name of the preprint server, as part of the reference. The preprint DOI should also be provided.

Acceptable references and their placement
Most, if not all, references should first be cited in the Introduction and/or Material and Methods section. Only those references that have been previously cited or that relate directly to the outcomes of the present study may be cited in the Discussion.

Only peer-reviewed, published material may be cited as a reference. Manuscripts in preparation, manuscripts submitted for consideration, and unpublished theses are not acceptable references.

Abstracts are considered unpublished observations and are not allowed as references unless follow-up studies were completed and published in peer-reviewed journals.

References to foreign language publications should be kept to a minimum (no more than 3). **They are permitted only when the original article has been translated into English.** The translated title should be cited and the original language noted in brackets at the end of the citation.

Textbook references should be kept to a minimum, as textbooks often reflect the opinions of their authors and/or editors. The most recent editions of textbooks should be used. Evidence-based journal citations are preferred.

Reference formatting
References must be identified in the body of the article with superscript Arabic numerals. At the end of a sentence, the reference number falls after the period.

The complete reference list, double-spaced and in numerical order, should follow the Conclusions section but start on a separate page. Only references cited in the text should appear in the reference list.

Reference formatting should conform to **Vancouver style** as set forth in "Uniform Requirements for Manuscripts Submitted to Biomedical Journals" (Ann Intern Med 1997;126:36-47).

References should be manually numbered.

List up to six authors. If there are seven or more, after the sixth author's name, add et al.

Electronic Artwork

General points
- Make sure you use uniform lettering and sizing.
- Embed the used fonts if the application provides that option.
- Use the font Ariel or Helvetica in your illustrations.
- Number the illustration files according to their sequence in the text.
- Use a logical naming convention for your artwork files.
- Provide figure legends in the Figure section.
- Size the illustrations close to the desired dimensions of the published version.
- Submit each illustration as a separate file.

A detailed guide on electronic artwork is available on our website:
https://www.elsevier.com/artworkinstructions.**You are urged to visit this site; some excerpts from the detailed information are given here.**

Formats
If your electronic artwork is created in a Microsoft Office application (Word, PowerPoint, Excel) then please supply 'as is' in the native document format.
Regardless of the application used other than Microsoft Office, when your electronic artwork is finalized, please 'Save as' or convert the images to one of the following formats (note the resolution requirements for line drawings, halftones, and line/halftone combinations given below):
TIFF (or JPEG): Color or grayscale photographs (halftones), keep to a minimum of 300 dpi.
TIFF (or JPEG): Bitmapped (pure black & white pixels) line drawings, keep to a minimum of 600 dpi.
TIFF (or JPEG): Combinations bitmapped line/half-tone (color or grayscale), keep to a minimum of 600 dpi.
Please do not:
- Supply files that are optimized for screen use (e.g., GIF, PNG, PICT, WPG); these typically have a low number of pixels and limited set of colors;
- Supply files that are too low in resolution? or smaller than 5.75 × 3.85-inch.;
- Submit graphics that are disproportionately large for the content.

Color artwork
Please make sure that artwork files are in an acceptable format (TIFF or JPEG)and with the correct size and resolution. If, together with your accepted article, you submit usable color figures then Elsevier will ensure, at no additional charge, that these figures will appear in color online (e.g., ScienceDirect and other sites) in addition to color reproduction in print. For further information on the preparation of electronic artwork, please see https://www.elsevier.com/artworkinstructions.

Figure captions
Ensure that each illustration has a caption. Supply captions separately, not attached to the figure. A caption should comprise a brief title (**not** on the figure itself) and a description of the illustration. Keep text in the illustrations themselves to a minimum but explain all symbols and abbreviations used. See Sample Figures page.

Tables

Tables should be self-explanatory and should supplement, not duplicate the text. Provide all tables at the end of the manuscript after the reference list and before the Figures. There should be only one table per page. Omit internal horizontal and vertical rules (lines). Omit any shading or color.Do not list tables in parts (Table Ia, Ib, etc.). Each should have its own number. Number the tables in the order in which they are mentioned in the text (Table 1., Table 2, etc).Supply a concise legend that describes the content of the table. Create descriptive column and row headings. Within columns, align data such that decimal points may be traced in a straight line. Use decimal points (periods), not commas, to mark places past the integer (eg, 3.5 rather than 3,5).In a line beneath the table, define any abbreviations used in the table.If a table (or any data within it) was published previously, give full credit to the original source in a footnote to the table. If necessary, obtain permission to reprint from the author/publisher.The tables should be submitted in Microsoft Word. If a table has been prepared in Excel, it should be imported into the manuscript.

References

Citation in text
Please ensure that every reference cited in the text is also present in the reference list (and vice versa). Any references cited in the abstract must be given in full. Unpublished results and personal communications are not permitted in the reference list, but may be mentioned in the text. Citation of a reference as 'in press' implies that the item has been accepted for publication.

Abbreviate journal names per the **Cumulative Index Medicus**. A complete list of standard abbreviations is available through the PubMed website: http://www.ncbi.nlm.nih.gov/nlmcatalog/journals.

Format for journal articles: Supply the last names and initials of all authors; the title of the article; the journal name; and the year, volume, and page numbers of publication. Do not use italics, bold, or underlining for any part of the reference. Put a period after the initials of the last author, after the article title, and at the end of the reference. Put a semicolon after the year of publication and a colon after the volume. *Issue numbers are not used in Vancouver style.*

Ex: Jones ER, Smith IM, Doe JQ. Uses of acrylic resin. J Prosthet Dent 1985;53:120-9.

Book References: The most current edition must be cited. Supply the names and initials of all authors/editors, the title of the book, the city of publication, the publisher, the year of publication, and the inclusive page numbers consulted. Do not use italics, bold, or underlining for any part of the reference.

Ex: Zarb GA, Carlsson GE, Bolender CL. Boucher's prosthodontic treatment for edentulous patients. 11th ed. St. Louis: Mosby; 1997. p. 112-23.

References should not be submitted in Endnote or other reference-generating software. Endnote formatting cannot be edited by the Editorial Office or reviewers, and must be suppressed or removed from the manuscript prior to submission. Nor should references be automatically numbered. Please number manually.

See Sample Manuscript.

Approved Abbreviations for Journals
Because the *Journal of Prosthetic Dentistry* is published not only in print but also online, authors must use the standard PubMed abbreviations for journal titles. If alternate or no abbreviations are used, the references will not be linked in the online publication. A complete list of standard abbreviations is available through the PubMed website: http://www.ncbi.nlm.nih.gov/nlmcatalog/journals.

Video

Elsevier accepts video material and animation sequences to support and enhance your scientific research. Authors who have video or animation files that they wish to submit with their article are strongly encouraged to include links to these within the body of the article. This can be done in the same way as a figure or table by referring to the video or animation content and noting in the body text where it should be placed. All submitted files should be properly labeled so that they directly relate to the video file's content. In order to ensure that your video or animation material is directly usable, please provide the file in one of our recommended file formats with a preferred maximum size of 150 MB per file, 1 GB in total. Video and animation files supplied will be published online in the electronic version of your article in Elsevier Web products, including ScienceDirect. Please supply 'stills' with your files: you can choose any frame from the video or animation or make a separate image. These will be used instead of standard icons and will personalize the link to your video data. For more detailed instructions please visit our video instruction pages. Note: since video and animation cannot be embedded in the print version of the journal, please provide text for both the electronic and the print version for the portions of the article that refer to this content.

Supplementary material

Supplementary material such as applications, images and sound clips, can be published with your article to enhance it. Submitted supplementary items are published exactly as they are received (Excel or PowerPoint files will appear as such online). Please submit your material together with the article and supply a concise, descriptive caption for each supplementary file. If you wish to make changes to supplementary material during any stage of the process, please make sure to provide an updated file. Do not annotate any corrections on a previous version. Please switch off the 'Track Changes' option in Microsoft Office files as these will appear in the published version.

Research data
This journal encourages and enables you to share data that supports your research publication where appropriate, and enables you to interlink the data with your published articles. Research data refers to the results of observations or experimentation that validate research findings, which may also include software, code, models, algorithms, protocols, methods and other useful materials related to the project.

Below are a number of ways in which you can associate data with your article or make a statement about the availability of your data when submitting your manuscript. If you are sharing data in one of these ways, you are encouraged to cite the data in your manuscript and reference list. Please refer to the "References" section for more information about data citation. For more information on depositing, sharing and using research data and other relevant research materials, visit the research data page.

Data linking
If you have made your research data available in a data repository, you can link your article directly to the dataset. Elsevier collaborates with a number of repositories to link articles on ScienceDirect with relevant repositories, giving readers access to underlying data that gives them a better understanding of the research described.

There are different ways to link your datasets to your article. When available, you can directly link your dataset to your article by providing the relevant information in the submission system. For more information, visit the database linking page.

For supported data repositories a repository banner will automatically appear next to your published article on ScienceDirect.

In addition, you can link to relevant data or entities through identifiers within the text of your manuscript, using the following format: Database: xxxx (e.g., TAIR: AT1G01020; CCDC: 734053; PDB: 1XFN).

Data statement
To foster transparency, we encourage you to state the availability of your data in your submission. This may be a requirement of your funding body or institution. If your data is unavailable to access or unsuitable to post, you will have the opportunity to indicate why during the submission process, for example by stating that the research data is confidential. The statement will appear with your published article on ScienceDirect. For more information, visit the Data Statement page.

Submission Checklist
The following list will be useful during the final checking of an article before sending it to the journal for review. Please consult this Guide for Authors for further details of any item. **Ensure the following items are present:**
One author has been designated as the corresponding author with contact details:
Email addressFull postal addressPhone number
All necessary files have been uploaded, and contain the following:
All figure thumbnails and legends All tables (including title, description, footnotes) Justification letter for more than 4 authors Patient photo permission IRB statements
Further considerations: Manuscript has been 'spell-checked' and 'grammar-checked'References are in the correct format for this journal All references mentioned in the Reference list are cited in the text, and vice versaThere are call-outs for each figure in the text Permission has been obtained for the use of copyrighted material from other sources (including the Web)
For any further information please visit our customer support site at https://service.elsevier.com.

AFTER ACCEPTANCE

Proofs
One set of page proofs (as PDF files) will be sent by e-mail to the corresponding author or, a link will be provided in the e-mail so that authors can download the files themselves. Elsevier now provides authors with PDF proofs which can be annotated; for this you will need to download Adobe Reader version 7 (or higher) available free from http://get.adobe.com/reader. Instructions on how to annotate PDF files will accompany the proofs (also given online). The exact system requirements are given at the Adobe site: http://www.adobe.com/products/reader/tech-specs.html.

If you do not wish to use the PDF annotations function, you may list the corrections (including replies to the Query Form) and return them to Elsevier in an e-mail. Please list your corrections quoting line number. If, for any reason, this is not possible, then mark the corrections and any other comments (including replies to the Query Form) on a printout of your proof and return by fax, or scan the pages and e-mail, or by post. Please use this proof only for checking the typesetting, editing, completeness and correctness of the text, tables and figures. Significant changes to the article as accepted for publication will only be considered at this stage with permission from the Editor. We will do everything possible to get your article published quickly and accurately – please let us have all your corrections within 48 hours. It is important to ensure that all corrections are sent back to us in one communication: please check carefully before replying, as inclusion of any subsequent corrections cannot be guaranteed. Proofreading is solely your responsibility. Note that Elsevier may proceed with the publication of your article if no response is received.

Online proof correction
To ensure a fast publication process of the article, we kindly ask authors to provide us with their proof corrections within two days. Corresponding authors will receive an e-mail with a link to our online proofing system, allowing annotation and correction of proofs online. The environment is similar to MS Word: in addition to editing text, you can also comment on figures/tables and answer questions from the Copy Editor. Web-based proofing provides a faster and less error-prone process by allowing you to directly type your corrections, eliminating the potential introduction of errors.
If preferred, you can still choose to annotate and upload your edits on the PDF version. All instructions for proofing will be given in the e-mail we send to authors, including alternative methods to the online version and PDF.
We will do everything possible to get your article published quickly and accurately. Please use this proof only for checking the typesetting, editing, completeness and correctness of the text, tables and figures. Significant changes to the article as accepted for publication will only be considered at this stage with permission from the Editor. It is important to ensure that all corrections are sent back to us in one communication. Please check carefully before replying, as inclusion of any subsequent corrections cannot be guaranteed. Proofreading is solely your responsibility.

Offprints
The corresponding author will, at no cost, receive a customized Share Link providing 50 days free access to the final published version of the article on ScienceDirect. The Share Link can be used for sharing the article via any communication channel, including email and social media. For an extra charge, paper offprints can be ordered via the offprint order form which is sent once the article is accepted for publication. Corresponding authors who have published their article gold open access do not receive a Share Link as their final published version of the article is available open access on ScienceDirect and can be shared through the article DOI link.

Permissions
All quoted material must be clearly marked with quotation marks and a reference number. If more than 5 lines are quoted, a letter of permission must be obtained from the author and publisher of the quoted material.All manuscripts are submitted to software to identify similarities between the submitted manuscript and previously published work. If quotations are more than 1 paragraph in length, open quotation marks at the beginning of each paragraph and close quotation mark at the end of the final paragraph only. Type all quoted material exactly as it appears in the original source, with no changes in spelling or punctuation. Indicate material omitted from a quotation with ellipses (3 dots) for material omitted from within a sentence, 4 dots for material omitted after the end of a sentence). If any submitted photographs include the eyes of a patient, the patient must sign a consent form authorizing use of his/her photo in the Journal. If such permission is not obtained, the eyes will be blocked with black bars at publication. Illustrations that are reprinted or borrowed from other published articles/books cannot be used without the permission of the original author and publisher. The manuscript author must secure this permission and submit it for review. In the illustration legend, provide the full citation for the original source in parentheses.

Interest in Commercial Companies and/or Products
Authors may not directly or indirectly advertise equipment, instruments, or products in which they have a personal investment.Statements and opinions expressed in the manuscripts are those of the authors and not necessarily those of the editors or publisher. The editors and publisher disclaim any responsibility or liability for such material. Neither the editors nor the publisher guarantee, warrant, or endorse any product or service advertised in the Journal; neither the editors nor the publisher

guarantee any claim made by the manufacturer of said product or service. Authors must disclose any financial interest they may have in products mentioned in an article. This disclosure should be typed after the Conclusions section.

Writing Guidelines
General Policies and Suggestions
Authors whose native language is not English should obtain the assistance of an expert in English and scientific writing before submitting their manuscripts. Manuscripts that do not meet basic language standards will be returned before review.The Journal does not use first person (I, we, us, our, etc.). "We conducted the study" can be changed easily to "The study was conducted." Avoid the use of subjective terms such as "extremely", "innovative" etc. The JPD uses the serial comma which is the comma that precedes the conjunction before the final item in a list of three or more items: The tooth was prepared with a diamond rotary instrument, carbide bur, and carbide finishing bur. We prefer the nonpossessive form for eponyms: the Tukey HSD test rather than Tukey's HSD test, Down syndrome rather than Down's syndrome and so on.Describe experimental procedures, treatments, and results in passive tense. All else should be written in an active voice. Describe teeth by name (eg, maxillary right first molar), not number. Hyphens are not used for common suffixes and prefixes, unless their use is critical to understanding the word. Some prefixes with which we do not use hyphens include: pre-, non-, anti-, multi-, auto-, inter-, intra-, peri-.Eliminate the use of i.e. and e.g. as they are not consistent with Journal style. Spell out seconds, minutes, hours, etc.Only use abbreviations in the Tables.Avoid the repeated use of Product names in the manuscript. Please initially identify all the products used in the experiment and subsequently refer to them by generic terms.It is generally better to paraphrase information from a published source than to use direct quotations. Paraphrasing saves space. The exception is a direct quotation that is unusually pointed and concise. When long terms with standard abbreviations (as in TMJ for *temporomandibular joint*) are used frequently, spell out the full term upon first use and provide the abbreviation in parentheses. Use only the abbreviation thereafter. Even very common acronyms should still be defined at first mention. We do not italicize foreign words such as "in vivo", "in vitro." Abbreviate units of measurement without a period in the text and tables (9 mm). Insert a nonbreaking space between all numbers and their units (100 mm, 25 MPa) except before % and °C. There should never be a hyphen between the number and the abbreviation or symbol except when in adjectival form (100-mm span). Spell out "degrees" for angles. Use the degree symbol only for temperature, include a space between the number and degree symbol (e.g., 37 C). Contractions such as don't, it's, wouldn't, etc are not used in scientific writing.Avoid using the words "'respectively"' or "'former/latter."' Both force the reader to stop and backtrack.For the common statistical outcomes P, a, ß omit the zero before the decimal point as these cannot be greater than 1. Proprietary names function as adjectives. Nouns must be supplied after their use, as in *Vaseline petroleum jelly*. Wherever possible, use only the generic term. Do not use trademark symbols as they are not consistent with Journal style.

Some Elements of Effective Style
Short words. Short words are preferable to long ones if shorter word is equally precise.Familiar words. Readers want information that they can grasp easily and quickly. Simple, familiar words provide clarity and impact. Specific rather than general words. Specific terms pinpoint meaning and create word pictures; general terms may be fuzzy and open to varied interpretations. Brisk opening. Plunge into your subject in the first paragraph of the article. Limited use of modifying words and phrases. Check your adjectives, adverbs, and prepositional phrases. If they are not needed, strike them out. No unnecessary repetition. An idea may be repeated for emphasis—so long as that repetition is effective. Short sentence length. Twenty words or less is recommended. Rambling sentences cluttered with subordinate clauses and other modifiers are hard to read and may cause readers to lose their train of thought. Short sentences should, however, be balanced with somewhat longer ones to avoid monotony. Paragraphs. Break up long sections into paragraphs but avoid the use of single sentence paragraphs. Restraint. Writers who use flamboyant words or overstate their proposition or conclusions discredit themselves. Facts speak for themselves. Clearly stated conclusions. Don't hedge. If you don't know something, say so.

Objectionable Terms
The following are selected objectionable terms and their proper substitutes. For a complete list of approved prosthodontic terminology, consult the eighth edition of the *Glossary of Prosthodontic Terms* (J Prosthet Dent 2005;94:10-92).

Or visit JPD http://www.prosdent.org and click on Collections/Glossary of Prosthodontic Terms.

Alginate *use* Irreversible hydrocolloidBite *use* OcclusionBridge *use* Partial fixed dental prosthesisCase *use* Patient, situation, or treatment as appropriateCure *use* PolymerizeFinal *use* DefinitiveFreeway space *use* Interocclusal distanceFull denture *use* Complete dentureLower (teeth, arch) *use* MandibularModel *use* CastModeling compound *use* Modeling plastic impression compoundMuscle trimming *use* Border moldingOverbite, overjet *use* Vertical overlap, horizontal overlapPeriphery *use* BorderPost dam, postpalatal seal *use* Posterior palatal sealPrematurity *use* Interceptive occlusal contactSaddle *use* Denture baseStudy model *use* Diagnostic castTake impressions, photographs, radiographs *use* MakeUpper (teeth, arch) *use* MaxillaryX-ray, roentgenogram *use* Radiograph

In addition, *specimen* should be used rather than *sample* when referring to an example regarded as typical of its class.

Additional Terminology Guidelines
Acrylic
An adjective form that requires a noun, as in acrylic resin.

Affect, effect
Affect is a verb; effect is a noun.

African American
Spelled thus and preferred over Negro and black in both adjective (African American patients) and noun (... of whom 20% were African Americans) forms.

Average, mean, median
Mean and average are synonyms. Median refers to the midpoint in a range of items; the midpoint has many items above as below it.

Basic
Like fundamental, this word is often unnecessary. An example of unnecessary use: Dental implants consist of two basic types: subperiosteal and endosteal.

Between, among
Use between when 2 things are involved and among when there are more than 2.

Biopsy
This noun should NOT be used as a verb. A biopsy was performed on the Tissue, rather than: The tissue was biopsied.

Centric
An adjective that requires a noun, as in centric relation.

Currently, now, at present, etc.
These expressions are often unnecessary, as in: This technique is currently being used...

Data
Use as a plural, as in: The data were...

Employ
Should not become an elegant variation of use, as in This method is employed ...

Ensure
Preferred over insure in the sense of to make certain.

Fewer, less
Use fewer with nouns that can be counted (fewer patients were seen) and less with nouns that cannot be counted (less material was used).

Following
After is preferred.

Imply, infer

The speaker implies; the listener infers.

Incidence
The rate at which a disease occurs in a given time; sometimes confused with prevalence (the total number of cases of a disease in a given region).

Majority
Means more than half; use most when you mean almost all. **Male, female**
For adult humans, use men and women. For children, use boys and girls.

Must, should
Must means that the course of action is essential. Should is less strong and means that the course of action is recommended.

Numbers
Spell out numbers used in titles or headings and numbers at the beginning of a sentence. The spelled version may also be preferable in a series of consecutive numbers that may confuse the reader (eg, 2 3.5-inch disks should be written two 3.5-inch disks). In all other cases, use Arabic numerals.

Orient
Proper form; avoid orientate.

Pathologic
Use instead of pathological. Other words in which the suffix -al has been dropped include biologic, histologic, and physiologic.

Pathology
The study of disease; often mistaken for pathosis (the condition of disease)

Percent
Use the percent sign in the text, as in The distribution of scores was as follows: adequate, 8%; oversized, 23%; and undersized, 69%. But spell out when the percent opens a sentence, as in Twenty percent of the castings ...

Prior to
Before is preferred.

Rare, infrequent, often not, etc.
Whenever possible, these vague terms should be backed up with a specific number.

Rather
Like very, this word should be avoided.

Regimen
A planned program for taking medication, dieting, exercising, etc. Not to be confused with regime, meaning a system of government or management.

Sex
Use "sex" rather than "gender" unless you are referring to the socially constructed roles, behaviors, activities, and attributes that a given society considers appropriate for men and women.

Symptomatology
The science or study of symptoms; this word is not a synonym for the word symptoms.

Technique
Preferred over technic.

Using
Avoid the dangling modifier in sentences such as "The impression was made using vinyl polysiloxane impression material." Write "with" or "by using" instead.

Utilize
Use is preferred.

Vertical
An adjective that needs a noun, as in vertical relation.

Via
Use through, with, or by means of.

White
Preferred over Caucasian. This is true only if the patient is from the Caucasus region of Eastern Europe. If not, use the term, white to describe the patient.

Sample Manuscript
https://www.elsevier.com/__data/promis_misc/YMPRmanuscripttipssample.pdf

AUTHOR INQUIRIES

Visit the Elsevier Support Center to find the answers you need. Here you will find everything from Frequently Asked Questions to ways to get in touch.
You can also check the status of your submitted article or find out when your accepted article will be published.