

Lava™ Crowns and Bridges Marginal Fit

Marginal fit is an important characteristic that can contribute to clinical performance. Having said that, the maximum tolerance needed to prevent damage of the pulp and/or development of secondary caries by intrusion of bacteria and toxins is still a matter of debate among researchers.

Nevertheless, the dentist and dental technician need to precisely control and optimize the fit of the restoration with the respective production technology used for fabrication. When using CAD/CAM technology, the fit can be set for each abutment tooth in the software (e.g., 3M™ ESPE™ Lava™) which customizes the marginal gap for the clinical situation. The accuracy and ability of all CAD/CAM technologies to implement the predetermined fit depends on the accuracy of the entire system from the scanning device, milling material and milling unit. In the case of pre-sintered ceramic (e.g. Zirconia), the homogeneity of the material is especially important as it controls shrinkage during the final sintering process. The accuracy of the entire CAD/CAM system is a responsibility of the manufacturers.

Different methods were used in the literature to determine the fit of a restoration, which made it difficult to compare the various studies. The first important step was done by Holmes et al¹ (1989) who established uniform terminology including marginal gap, absolute marginal gap, vertical marginal gap, horizontal marginal gap, as well as over- and under-extension. [fig. 1]

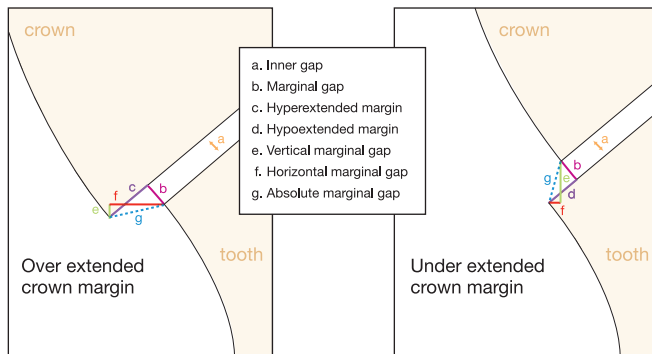


fig. 1 Terminology for fit determination of restorations according to Holmes et al. (1989)¹

Several authors determined the gap of Lava™ Crowns and Bridges restorations in comparison to other Zirconia restorations fabricated with their respective CAD/CAM systems.

Dr. A. Piwowarczyk and Prof. Lauer of the University of Frankfurt published at the conference of the European division of the International Association of Dental Research (IADR, PEF) in 2006² a thorough analysis on the marginal gap and absolute marginal gap of 4-unit Zirconia bridges made out of Lava Zirconia and by the Lava system in comparison to Cercon and DCS President bridges. All restorations were anonymously ordered at milling centres or laboratories. [fig. 2a, 2b] 3M ESPE Lava showed the lowest marginal and absolute marginal gap.

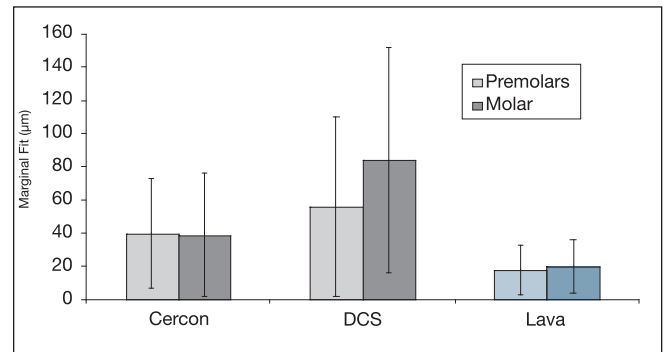


fig. 2a Marginal and absolute marginal gap in comparison to competitor systems. A. Piwowarczyk and H.C. Lauer, University of Frankfurt.²

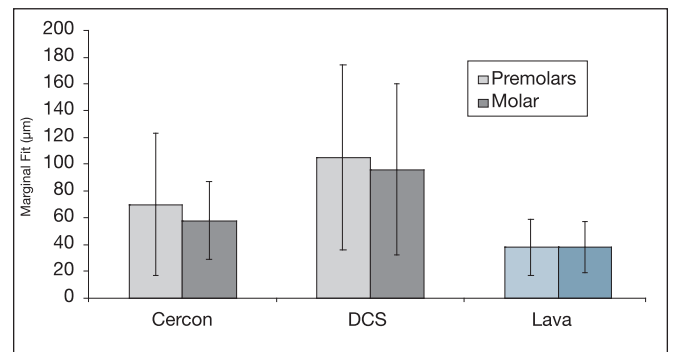


fig. 2b Marginal of 4-unit zirconia 3M™ ESPE™ Lava™ Bridges in comparison to competitor systems. A. Piwowarczyk and H.C. Lauer, University of Frankfurt.²

Lava™ Crowns and Bridges Marginal Fit (continued)

Dr. F. Beuer et al. (2005, 2006)³ analysed 3-unit Zirconia bridges made of Lava in comparison to Etkon (es1), Cercon brain, Cerec inLab and measured a very small marginal gap for Lava bridges. [Fig. 3]

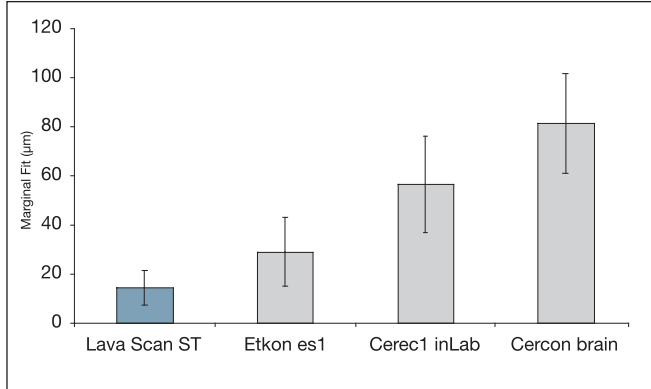


fig. 3 Marginal gap of 3-unit zirconia 3M™ ESPE™ Lava™ Bridges in comparison to competitor systems. F. Beuer et al., University of Munich.³

Moreover, A.J.T. Shannon, F. Qian, P. Tan, and D. Gratton published at the IADR meeting in 2007⁴ a comparison of the vertical marginal gap of Zirconia copings fabricated by different CAD/CAM systems [including KaVo Everest (ZH, ZS), Nobel Biocare Procera (MOD40, Piccolo, Forte), 3M ESPE Lava, Wieland Zeno, and Cerec inLab (InCeramZr)] and compared their vertical marginal gap to control cast copings. Only the 3M ESPE Lava copings showed no significant difference in fit to the control. [fig. 4]

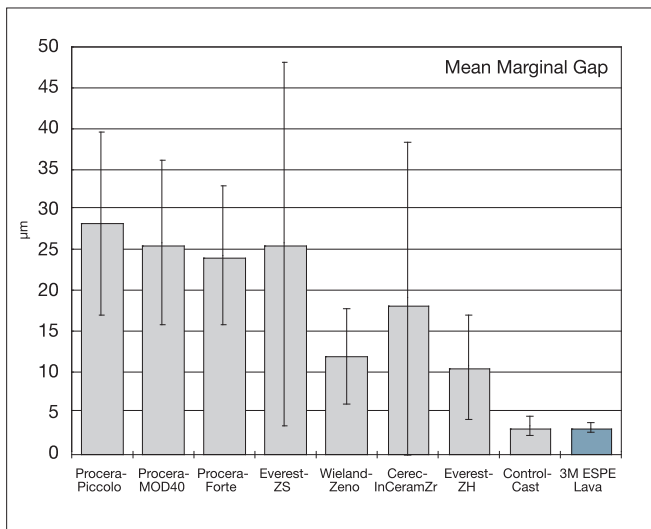


fig. 4 Vertical marginal gap of 3M™ ESPE™ Lava™ Copings in comparison to competitor systems. A.J.T. Shannon et al., University of Iowa.⁴

In summary, the 3M™ ESPE™ Lava™ CAD/CAM system in combination with the 3M™ ESPE™ Lava™ Zirconia results in an excellent fit of the restorations independent of the measure used. This shows not only the high accuracy of the scanning and milling device, but also the high homogeneity of the Zirconia material. □

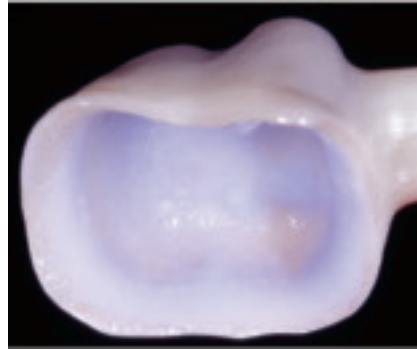


fig. 5 Excellent marginal fit of 3-unit Lava Zirconia bridge in vivo: The fit has been checked in vivo before placement of the restoration. The accuracy of the fit is shown by the thin layer of fit checker. Courtesy of Prof. Dr. D. Edelhoff, University of Munich.

- Holmes JR, Bayne SC, Holland GA, Sulik WD. (1989) Considerations in measurement of marginal fit. J. Prosthet Dent 62, 405-408
- A. Piwowarczyk, H.-C. Lauer (2006), Determining the marginal fit of CAD/CAM bridge frameworks, Pan European Federation Conference (PEF; CED) #0254
- F. Beuer, T. Fischer, K.-J. Erdelt, H.-U. Aggstadler, K. Spiegl, W. Gernet; (2005) IADR #1336 and In vitro Study Marginal fit of Lava restorations; F. Beuer, T. Fischer, K.-J. Erdelt, H.-U. Aggstadler, K. Spiegl, W. Gernet, industrial report (2006)
- A.J.T. Shannon, F. Qian, P. Tan, D. Gratton (2007) In-Vitro Vertical Marginal Gap Comparison of CAD/CAM Zirconium Copings, IADR #0828



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