References:

A. Mangano FG, Mangano C, Loktionova M, Dudnik O, Malanova O, Elovskaya A, Maltseva A, Dybov A. Additively manufactured hybrid composite implant-supported restorations: A retrospective clinical study of 145 patients with up to 2 years of follow-up. J Dent. 2025 Oct;161:105999. doi: 10.1016/j.jdent.2025.105999. Epub 2025 Jul 25. PMID: 40716554.
1. Mangano FG, Yang KR , Lerner H, Porrà T, Khachatryan LG, Gordienko ID, Admakin O. 3D-printed short-span hybrid composite implant-supported restorations fabricated through tilting stereolithography: a retrospective clinical study on 85 patients with 1 year of follow-up. J Dent. 2024 Feb:141:104792. PMID: 38013004 DOI: 10.1016/j.jdent.2024.105095.
2. De Angelis F, D'Amario M, Jahjah A, Frascaria M, Vadini M, Sorrentino E, Biferi V, D'Arcangelo C. Flexural properties of three novel 3D-printed dental resins compared to other resin-based restorative materials. Prosthesis. 2024; 6(3):619-630. https://doi.org/10.3390/prosthesis6030043
3. Internal data, DWS R&D
4. Pontlab S.r.l. Report 1583P24 08/05/2024
5. TDS EN_Irix Max_rev.02_03/2023
6. Corbani K, Hardan L, Eid R, Skienhe H, Alharbi N, Ozcan M, Salameh Z. Fracture resistance of three-unit fixed dental prostheses fabricated with milled and 3D printed composite-based materials. J Contemp Dent Pract. 2021 Sep 1;22(9):985-990. PMID: 35000940.
7. Mangano FG , Cianci D , Pranno N, Lerner H, Zarone F, Admakin O Trueness, precision, time-efficiency, and cost analysis of chairside additive and subtractive versus lab-based workflows for manufacturing single crowns: An in vitro study J Dent. 2024 Feb:141:104792. PMID: 38013004 DOI: 10.1016/j.jdent.2023.104792.
8. IN3DLAB_G_FLD_Tecnopolimeri_REV01_V3_0922
9. Corbani K, Hardan L, Eid R,, Skienhe H, Ozcan M, Alharbi N, Salameh Z. Effect of material thickness on the fracture resistance and failure pattern of 3D-printed composite crowns. Int J Comput Dent. 2020;23(3):225-233. PMID: 32789310
10. Rolando C, Rossi T, Baldi A, Comba A, Carossa M, Pera F, Alovisi M, Berutti E, Pasqualini D, Scotti N CAM-technique effect on cement volume and fatigue resistance of polymer-infiltrated ceramic network (PICN) restorations. Poster presented at the 2nd SIPRO (Italian Prosthodontics Society) National Congress. Florence, February 17-18, 2023 I Special Mention for Research in Prosthetics
11. Demirel M, Donmez MB, Çakmak G, Dede DÖ, Hinz S, Yilmaz B. Effect of manufacturing trinomial and restoration thickness on the fabrication trueness, fit, and margin quality of additively manufactured resin-based ultrathin laminate veneers J Dent. 2025 Feb 1:105606. DOI: 10.1016/j.jdent.2025.
12. Pot GJ, Van Overschelde PA, Keulemans F, Kleverlaan CJ, Tribst JPM. Mechanical Properties of Additive-Manufactured Composite-Based Resins for Permanent Indirect Restorations: A Scoping Review. Materials (Basel). 2024 Aug 8;17(16):3951. doi: 10.3390/ma17163951. PMID: 39203129; PMCID: PMC11355578.
13. Duarte S Jr, Phark JH. Advances in Dental Restorations: A Comprehensive Review of Machinable and 3D-Printed Ceramic-Reinforced Composites. J Esthet Restor Dent. 2025 Jan;37(1):257-276. doi: 10.1111/jerd.13371. Epub 2024 Nov 18. PMID: 39558703; PMCID: PMC11913211.
14. Cho K, Rajan G, Farrar P, Prentice L, B. Prusty BG, Dental resin composites: A review on materials to product realizations, Composites Part B: Engineering, Volume 230, 2022, 109495, ISSN 1359-8368, https://doi.org/10.1016/j.compositesb.2021.109495.
15. Chopra D, Guo T, Gulati K, Ivanovski S, Load, unload and repeat: Understanding the mechanical characteristics of zirconia in dentistry, Dental Materials, Volume 40, Issue 1, 2024, Pages e1-e17, ISSN 0109-5641, https://doi.org/10.1016/j.dental.2023.10.007
16. Scribante A, Bollardi M, Chiesa M, Poggio C, Colombo M; Flexural Properties and Elastic Modulus of Different Esthetic Restorative Materials: Evaluation after Exposure to Acidic Drink, BioMed Research International, 2019, 5109481, 8 pages, 2019. https://doi.org/10.1155/2019/5109481

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CLEAN, EASY, FAST, SMART

Irix Max & Dfab

Irix Max is a biocompatible photosensitive ceramic-filled translucent hybrid composite material (42% ceramic by weight) designed for the customized production of proven permanent dental restorations[1].
Its applications include the production of full (crowns and bridges up to three units) and partial (inlays, onlays, veneers), fixed restorations using a Dfab TSLA laser 3D printer.

The first in-vivo study of 3D printed permanent restorations:

Mangano et al. in the first retrospective study on indirect 3D printed composite restorations affirm [A,1]:

> **At the 2-year follow-up, all 95 implant-supported restorations remained functional, with no reported fractures or failures. The same was true for the 90 restorations evaluated 1 year after delivery. Both operators assessed the quality of closure and marginal fit of the restorations as excellent.**

De Angelis et al. wrote:
"Among the 3D-printed resins, the **best flexural strength** was achieved by Irix Max (135.0 MPa). All 3D-printed resins had a **higher flexural modulus** than the conventional PMMA materials. Irix Max showed **promising flexural properties,** which could encourage its use for permanent restorations[2]".

Why Choose Irix Max Over Milled Zirconia? [12-16]

Superior Flexibility & Elasticity
- Lower modulus of elasticity = less stiffness, more elasticity
- Adapts better under occlusal load compared to rigid zirconia

Enhanced Shock Absorption
- Distributes occlusal forces more evenly
- Reduces stress transfer to underlying teeth or implants
- Promotes a more comfortable, "cushioned" bite

Minimized Risk of Fracture

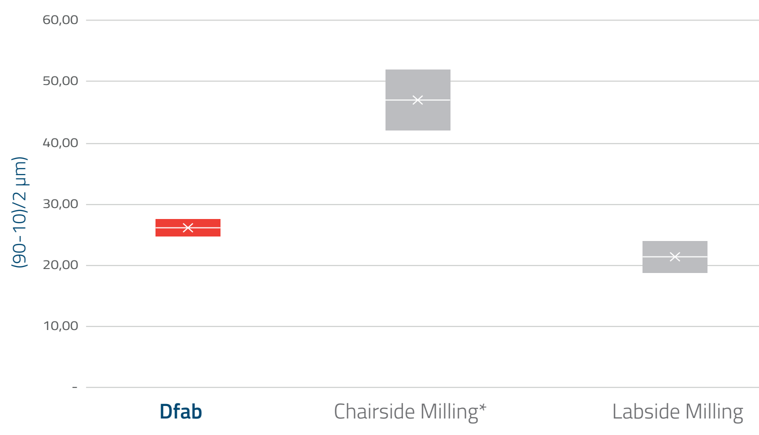
Compared to milled zirconia restorations, Irix Max restorations have a lower modulus of elasticity. This makes them less stiff and more elastic, allowing them to better absorb and distribute occlusal forces. Consequently, these restorations reduce stress transferred to underlying teeth or implants, providing a more comfortable, shock-absorbing occlusion. Additionally, hybrid composites are less brittle and have a lower risk of chipping than rigid zirconia.

Irix Max for Dfab | Technical Properties

Compressive Strength MPa	292 [3]	Fracture Resistance Three Units Bridge N	1360 [6]
Degree of Conversion %	80 [4]	Fracture Resistance[2] Crown Thickness 0.5, 1.0, 1.5 mm N	1345 | 1946 | 2384 [4]
Density g/cm³	1,36 [5]	Tensile Modulus MPa	3600 [3]
Elongation at Break %	3-4 [3]	Tensile Strength MPa	55 [3]
Flexural Modulus MPa	3505 [3] 4429 [2]	Viscosity ~ mPa•s @ 25°C	6000 [5]
Flexural Strength MPa	>100 [5] 135 [2]	Water Solubility µg/mm³	<1,4 [8,5]
Fracture Resistance 1.2M Cycles (5 Years Simulation)	No Fractures Observed [5]	Water Sorption µg/mm³	<10 [8,5]

Why Chairside 3D printing with Dfab?

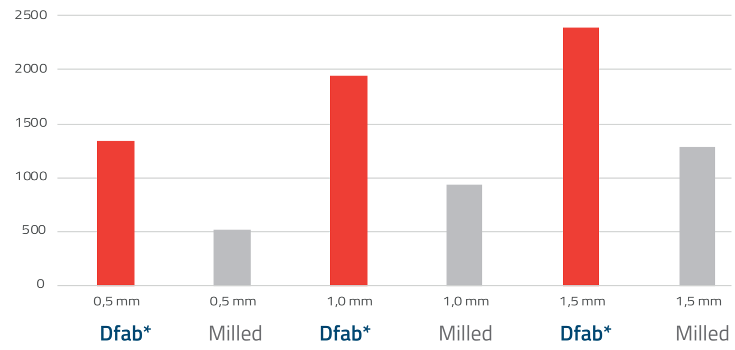
Marginal trueness in µm



* Statistically significative difference between Dfab (P< 0,01) and Labside Milling (P< 0,01)

Mangano et al. evaluated **the trueness, precision, time efficiency,** and cost of three different workflows (additive chairside: Dfab + Irix Max; subtractive chairside: inLab MC XL + lithium disilicate and lab-based subtractive: DWX-52D + zirconia) used for manufacturing single crowns.
Additive chairside and subtractive lab-based single crowns had significantly better marginal trueness than subtractive chairside Single Crowns in all three parameters. **Additive chairside manufacturing of definitive hybrid composite Single Crowns is now possible and shows high accuracy, time efficiency, and competitive cost**[7].

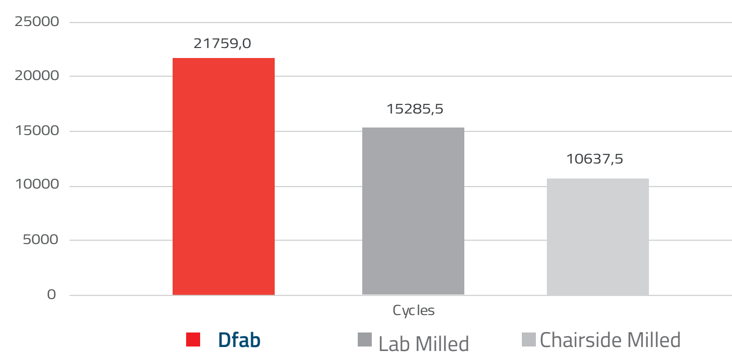
Fracture resistance (N)



* Statistically significative difference between the Dfab and Milled samples (P< 0,001)

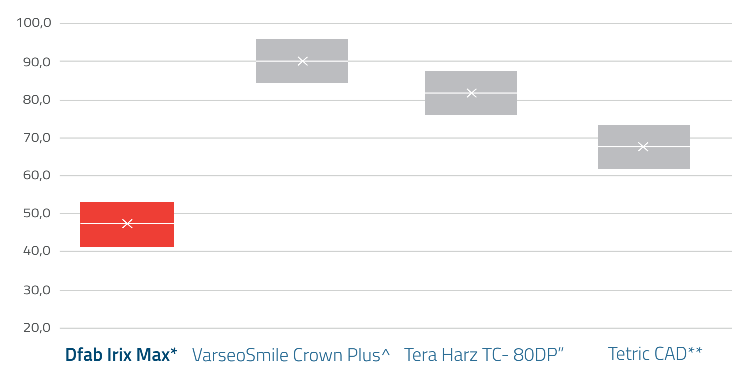
Corbani et al. studied **the fracture resistance** and failure pattern of 3D-printed (Dfab & Irix Max) and milled composite resin crowns (Cerec MC XL Dentsply Sirona and Coltene's Brilliant Crios blocks) as a function of different material thicknesses. **3D-printed Irix Max crowns showed high fracture resistance at different material thicknesses and can be suggested as a viable solution in conservative dentistry**[9].

Accelerated fatigue (number of cycles)



Rolando et al. studied **the fatigue resistance** of milled (laboratory DWX 51D, Roland or chairside, MCXL, Dentsply Sirona) polymer infiltrated ceramic network restorations (PICN), (Vita Enamic) or 3D printed (Dfab, Irix Max hybrid composite). The 3D printed samples showed a significantly higher fatigue resistance than lab-milled and chairside-milled specimens. The chairside-milling process was significantly worse than the lab-milled one[10].

Mean overall RMS* values and standard deviations at pooled thickness



Demirel et al. showed that Irix Max had **lower gaps and high trueness and fit.** Ultrathin laminate veneers fabricated with the Dfab TSLA technology and Irix Max may require **less clinical adjustments**[11].

The Root Mean Square (RMS) values represent the deviation of the TV.stl files (test veneers) from the RV.stl file (reference veneer).