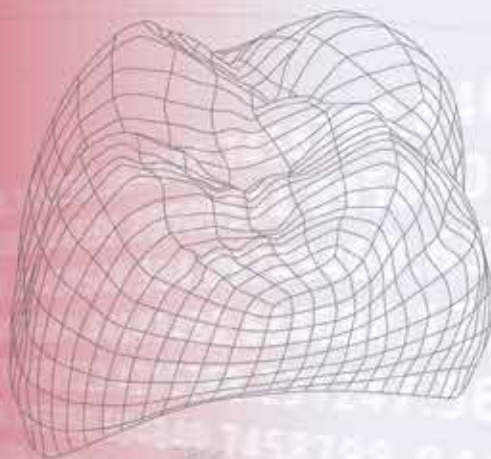


IPS®  
**e.max**



# ABSTRACT

## SCIENTIFIC REPORT

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English

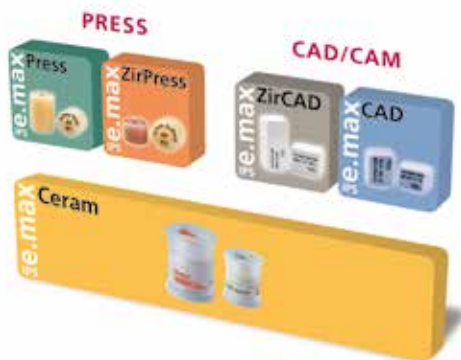
all ceramic  
all you need



**ivoclar**  
**vivadent**  
passion vision innovation

# Abstract

The IPS e.max® system is an innovative all-ceramic system that comprises lithium disilicate (LS<sub>2</sub>) glass-ceramic and zirconium oxide (ZrO<sub>2</sub>) materials for the press and CAD/CAM technologies. Additionally, there is a universally applicable nano-fluorapatite glass-ceramic available for veneering all IPS e.max components.



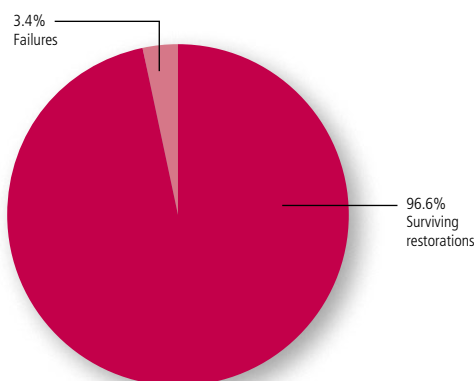
Since the beginning of its development until today, the IPS e.max system was monitored by the scientific community and many renowned experts have contributed to an excellent data base with their studies. The worldwide success story, the ever growing demand, as well as over 70 million fabricated restorations are testament to the success and the reliability of the system.

More than 20 clinical *in vivo* studies to date and even more *in vitro* studies, as well as the continuously rising number of clinical studies involving the IPS e.max system throughout the world show the long-term success in the oral cavities of the patients.

## Summary of the IPS e.max® System

There are data on the IPS e.max system that cover a period of up to 5 years of clinical use for zirconium oxide (ZrO<sub>2</sub>) and up to 10 years of clinical use for lithium disilicate glass-ceramic (LS<sub>2</sub>).

The survival rates\* of IPS e.max Press (6 studies), IPS e.max CAD (6 studies) and IPS e.max ZirCAD (8 studies) were combined and the overall survival rate of the entire system was calculated. A total of 1276 restorations from 20 clinical studies were included. The resulting overall survival rate for the IPS e.max system is 96.6%.



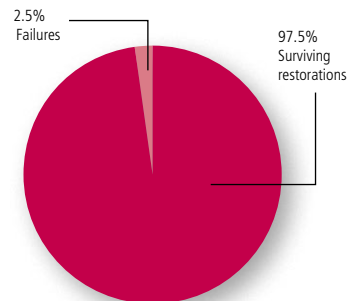
**Fig. 1:** Summary of the results of 20 clinical studies involving restorations (crowns and bridges) fabricated with IPS e.max materials; the distribution of success cases and failures is presented in percent.

## Summary of IPS e.max® Press

(Lithium disilicate glass-ceramic LS<sub>2</sub>)

By now, there are results of clinical studies lasting up to 10 years for IPS e.max Press. The mean observation period is 5.6 years.

Five external clinical studies (Böning et al., 2006; Etman and Woolford, 2010; Guess et al., 2012; Gehrt et al., 2012; Dental Advisor 2012) and an internal Ivoclar Vivadent study with a combined total of 642 restorations (crowns) have shown a survival rate of 97.5% after a mean observation period of 5.6 years. The 2.5% failures\*\* include fractures (1.6%), endodontic failure (0.2%) and secondary caries (0.2%). Moreover, 4 crowns (0.6%) were removed in one study because of crack development. Chipping occurred in 3.4% of the restorations. However, all cases could be repaired in situ. Conventional and adhesive cementation work equally well.



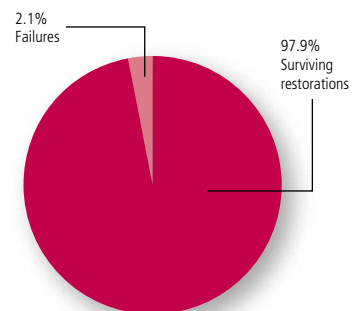
**Fig. 2:** Summary of the results of 6 clinical studies involving IPS e.max Press restorations (crowns); the distribution of success cases and failures is presented in percent.

## Summary of IPS e.max® CAD

(Lithium disilicate glass-ceramic LS<sub>2</sub>)

There are results of clinical studies lasting up to 4 years for IPS e.max CAD.

Six clinical studies (Richter et al., 2009; Nathanson, 2008; Reich et al., 2010; Fasbinder et al., 2010; Bindl, 2011; Sorensen et al., 2009b) with a total of 237 restorations (crowns) showed that 97.9% of the restorations survived after a mean observation period of 3 years. The failure rate of 2.1% includes 0.4% irreparable chipping and 1.7% fractures. In addition to the above case of irreparable chipping, no further chipping occurred.



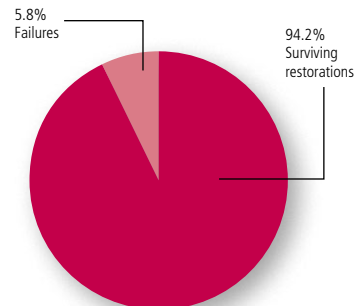
**Fig. 3:** Summary of the results of 6 clinical studies involving IPS e.max CAD restorations (crowns); the distribution of success cases and failures is presented in percent.

### Summary of IPS e.max® ZirCAD

(Zirconium oxide ZrO<sub>2</sub>)

There are data on IPS e.max ZirCAD that cover a period of up to 5 years of clinical use.

Eight clinical studies (Stanford 2009; Sorensen et al. 2009a; Fasbinder and Dennison 2009; Beuer, 2011B; Gehrt, 2012; Christensen et al., 2008; Muñoz 2009; Holmes et al. 2012) involving a total of 397 restorations have shown a survival rate of 94.2%. The failure causes include 2.3% irreparable chipping, 2.0% fractures, 0.8% endodontic failure and one root fracture (0.3%). Moreover, 2 cases of repeated decementation were rated as failures. Chipping occurred in 12% of the restorations, but required replacement of the restoration in only 2.3% of the cases.



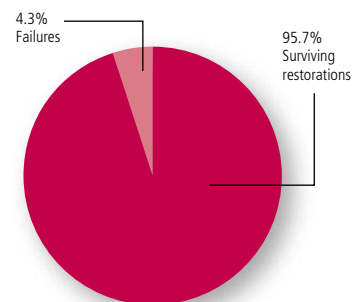
**Fig. 4:** Summary of the results of 8 clinical studies involving IPS e.max ZirCAD restorations (crowns, bridges); veneered with IPS e.max ZirPress and/or IPS e.max Ceram; the distribution of success cases and failures are presented in percent.

### Summary of IPS e.max® ZirPress

(Fluorapatite glass-ceramic)

There are data on IPS e.max ZirPress that cover a period of up to 4 years of clinical use.

Four clinical studies (Gehrt et al., 2012; Christensen et al., 2008; Holmes et al., 2012; Fasbinder and Dennison, 2009), involving a total of 186 restorations (123 crowns, 63 bridges) made of IPS e.max ZirPress as a veneer on zirconium oxide have shown a survival rate of 95.7%. Chipping occurred in 15% of the restorations, but was irreparable in only 1.6% of the cases. All other chipping incidents could be repaired *in situ* by means of polishing or composite. The overall failure rate was 4.3%, which includes a case of root fracture (0.5%) as well as 2 endodontic failures (1.1%).



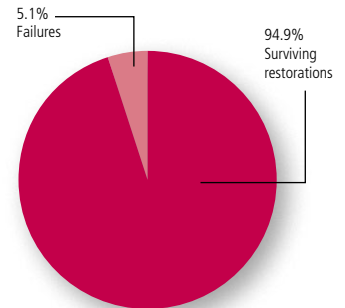
**Fig. 5:** Summary of the results of 4 clinical studies involving IPS e.max ZirPress on IPS e.max ZirCAD restorations (crowns, and bridges); the distribution of success cases and failures is presented in percent.

## Summary of IPS e.max® Ceram

(Nano-fluorapatite glass-ceramic)

There are data on IPS e.max Ceram that cover a period of up to 5 years of clinical use.

Eight clinical studies (Dental Advisor 2010; Nathanson 2008; Richter et al. 2009; Stanford 2009; Sorensen et al. 2009a; Fasbinder and Dennison 2009; Beuer, 2011b; Holmes et al., 2012), involving a total of 369 restorations veneered with IPS e.max Ceram have shown a survival rate of 94.9%. The failures include 2.4% irreparable chipping, 1.9% fracture of the framework (different materials), 0.5% endodontic failure, and a decementation rated as failure (0.3%). Chipping occurred in 6% of the restorations. However, more than half of them could be repaired *in situ*.

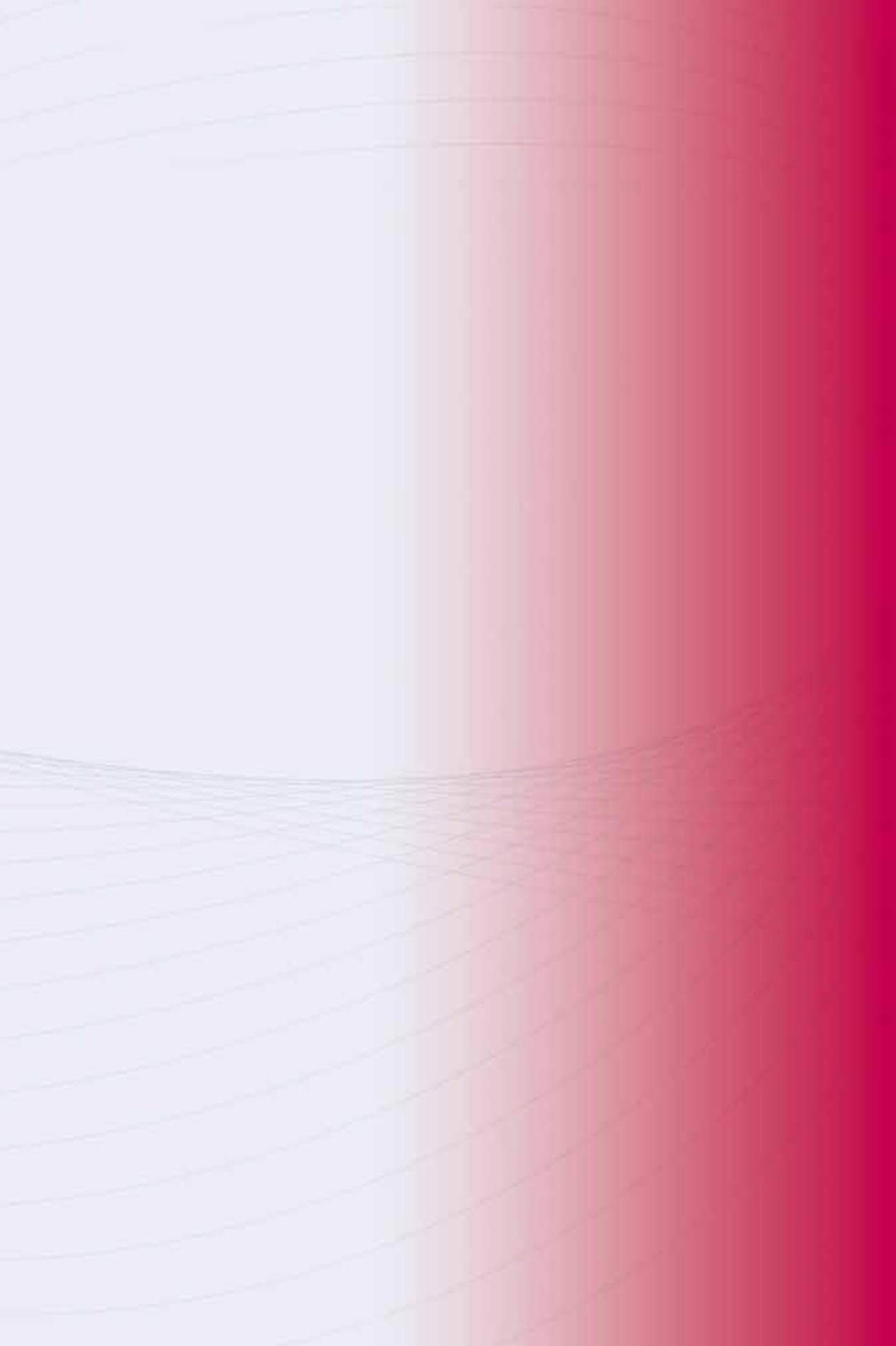


**Fig. 6 :** Summary of the results of 8 clinical studies involving IPS e.max Ceram on IPS e.max ZirCAD or IPS e.max CAD restorations and Crystal Zirconia (crowns, bridges); the distribution of success cases and failures is presented in percent.

*After all, IPS e.max stands for an all-ceramic system that offers an ideal solution for all indications, which not only works from a material standpoint, but is also backed by a wealth of scientific data.*

\* The most important study results as well as detailed information about the study design, successes, failures and survival rates can be found in the IPS e.max Scientific Report, vol. 02 / 2001-2013, and at [www.ivoclarvivadent.com](http://www.ivoclarvivadent.com).





[www.ivoclarvivadent.com](http://www.ivoclarvivadent.com)

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