

Short-term clinical evaluation of fixed zirconium-based restorations on implants.

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Lack of elasticity and proprioception makes implant-borne restorations more prone to technical complications. Material research did not prove the presence of chemical bond between zirconium and overlying ceramics. Nonetheless, the use of zirconium-based restorations is increasing in clinical practice. However, clinical evidence of success rates of zirconium-based crowns on implants is very sparse in the literature.

Objective

The aim of this study was to evaluate the veneer fracture rate of fixed zirconium-based restorations on implants delivered in private practice.

Material and methods

Throughout the period from 2005 to 2008 34 patients, 7 (21%) men and 27 (79%) women, received 76 implants, later restored with zirconia based prostheses. Total 63 cement-retained restorations consisting of up to 4 units were manufactured. Fifty one (81%) single crowns and 12 (19%) fixed partial dentures were delivered with regular occlusion scheme. Twenty-four (38%) restorations were inserted in anterior area while lateral segments received 39 prostheses (62%). All restorations were examined for presence or absence of contact during eccentric mandibular movements – 7 (11.1%) had contact with the opposing arch during protrusion, 5 (7.9%) - during lateral guidance, 57 (81%) were guidance-free. Three different zirconia systems were used for manufacturing restorations – VITA In-Ceram (43 cases), Ceramill ZI (13 cases) and Zircozahn (7 cases).

Patients were recalled and inspected for presence of ceramic veneer fracture of any kind. The follow-up time was registered. Data was collected from specially developed electronic questionnaire.



Figure 1. Framework of zirconium-based crown.

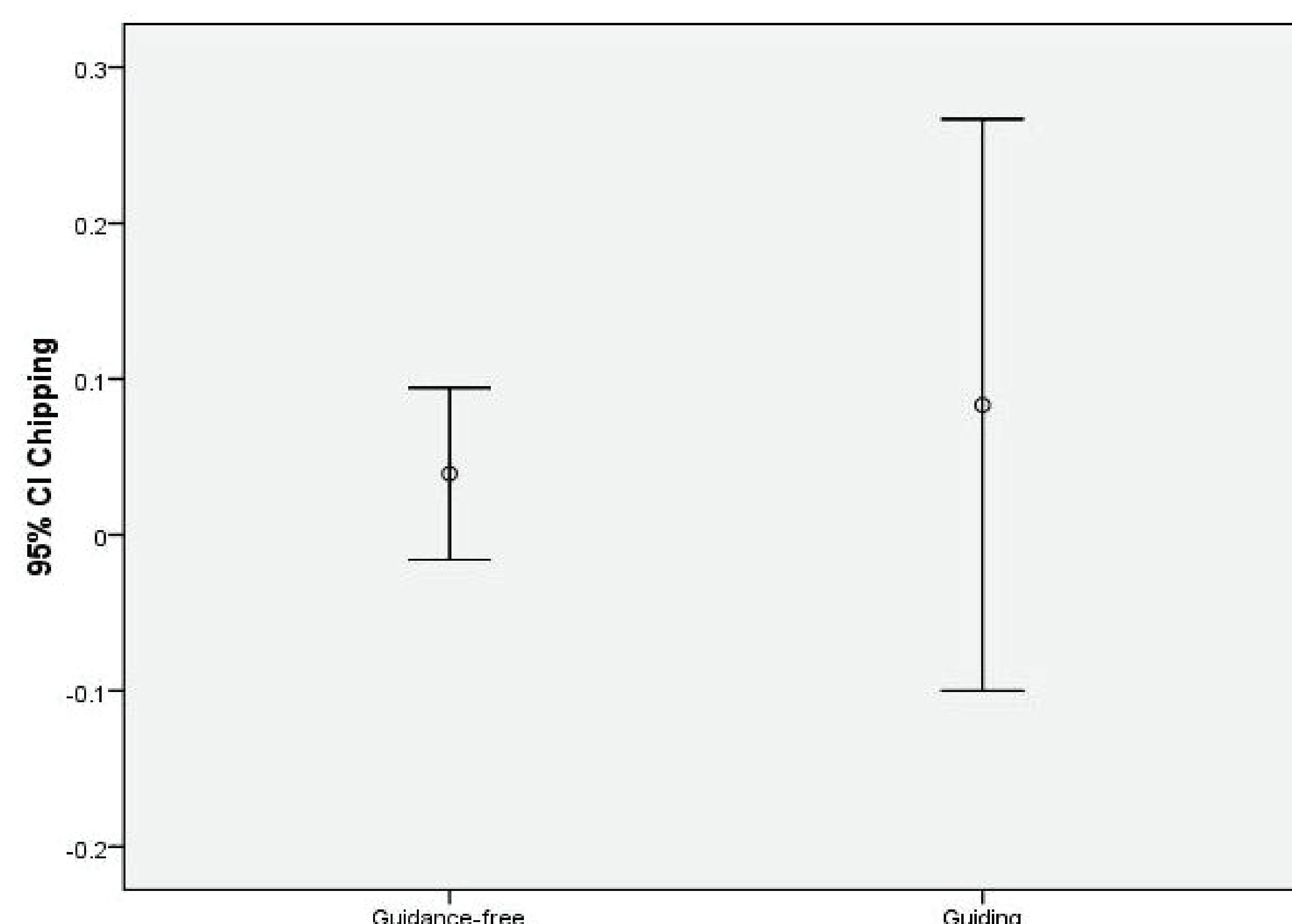


Figure 2. Zirconium-based crown.

Table 1. Complication rate among separate groups of restorations.

			Chipping		Total
			O.K.	Chipped	
Units_2	Single crowns	Count	50	1	51
		% within Units_2	98.0%	2.0%	100.0%
		% of Total	79.4%	1.6%	81.0%
	Splinted crowns	Count	7	2	9
		% within Units_2	77.8%	22.2%	100.0%
		% of Total	11.1%	3.2%	14.3%
	FPDs	Count	3	0	3
		% within Units_2	100.0%	.0%	100.0%
		% of Total	4.8%	.0%	4.8%
Total		Count	60	3	63
		% within Units_2	95.2%	4.8%	100.0%
		% of Total	95.2%	4.8%	100.0%

Figure 3. Guidance had no statistically significant difference on complication rate.



Results

All implants were successful at the moment of evaluation. No fracture of framework was registered, restorations were in function. Mean ceramic fracture rate was 4.8% as fracture occurred in 3 restorations. Mean follow-up time was 12 months, ranging from 6 to 29 months. According to the data available 1 fracture (4.16%) occurred in anterior segment and 2 – in lateral segment (5.12%). There was 1 failure in group of single crowns (2%) and 2 (16.6%) in FPD group. In-Ceram zirconia system encountered 2 fractures (4.7%), Zircozahn – 1 fracture (14.32%). One ceramic fracture (20%) occurred in lateral guidance group, 2 failures – in guidance-free group (3.9%).

Discussion

The major purpose of this retrospective study was to evaluate the veneer fracture rate of implant-supported zirconium based fixed restorations delivered in private practice. The results show a 4.8% incidence during an average of 12 months. It has to be stated that 1 year is a scarce period for making confident conclusions regarding the complication rate. In comparison Larsson et al reported cohesive chipping in 8 out of 25 zirconium restorations on implants, establishing failure rate at 32% after 1-year of follow-up, which is about 6 times higher, than in the current experiment. On the other hand, 100% success rate was recorded in prior study with an observation period of up to 3 years. So far 4.8% is much less than it is reported in studies related to tooth borne zirconium restorations, ranging 10% to 60% throughout the 5-year period. This finding is rather controversial, as implant-supported restorations are expected to have significantly more veneer complications compared to tooth-borne reconstructions. The growth of veneer complication rate could be caused by absence of periodontal ligament around implant. Hence, implant is almost immobile in relation to neighboring teeth and so additional forces have to be withstood by implant abutment, framework and veneering material. Moreover, absence of periodontal receptors disrupt patient's ability to perceive bite force properly, leading to up to 8 times higher loads for implants and their superstructures compared to teeth. However, it would be interesting to compare these results after a more extended observation period, which would also bring more objectivity into the study. Follow-up time had influence on the veneer fracture rate highest value being found in group 18-23 months (28.6%). Generally, studies show that rate of complications tends to enlarge as follow-up period increases. Despite that present study didn't show any statistically significant difference for separate follow-up groups.

Comparing single crown and FPD groups the rate slightly higher is recorded for the latter (2 cases against 1 making it 16.7% and 2% respectively). Tendency of single crowns to experience lowest complication rate has been confirmed in other studies. However, no statistically significant difference can be noted in present research. The study has revealed only one case of veneer fracture (8.3%) in guidance group (specifically – lateral guidance) and two cases in guidance-free group (3.9%). Thus, no sound statement can be made regarding influence of guidance on chipping. However, recent study by Linkevicius et al. lets us to assume that guidance can be considered the additional risk factor for increased ceramic veneer fracture.

Conclusion

Within the limitations of this study ceramic veneer fracture rate for zirconium-based implant-supported restorations is 4.8% during an average of 12 months of follow-up. Implant borne zirconium-based restorations on implants certainly need more long-term research.