Frictional Telescopic Crowns in Severely Reduced Dentitions: A 5-Year Clinical Outcome Study

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Clinical outcomes for frictional telescopic crowns supporting removable prostheses in patients with severely reduced dentitions with one to three remaining teeth per arch have been inadequately documented. Seventy-four patients with severely reduced dentitions received 82 telescopic removable partial dentures that were supported by 173 frictional telescopic crowns. The recorded individual telescopic abutment survival rate over a 60-month period was 80.6%. This observation was significantly influenced by sex and tooth vitality and mobility (Kaplan-Meier). The risk of loss of telescopic crowns was significantly influenced by sex, arch, vitality, and abutment tooth distribution (Cox regression). Telescopic removable partial dentures were proven to be a favorable treatment concept for severely reduced dentitions in the selected group of patients. *Int J Prosthodont 2012;25:217–220.*

As advanced life expectancy increases, so too does the number of people with severely reduced dentitions (SRDs) who need prosthodontic treatment. Based on longstanding clinical experience, the one to three remaining teeth in such patients are often periodontally compromised and unfavorably located. However, these teeth may be recruited for prosthesis abutment support in the context of financial and age-related concerns. So-called double crowns (eg, frictional fitting telescopes, telescopes with clearance fit, the Marburg double crown system, or conus crowns) are often used in diverse practice constituencies. However, most reported clinical studies are retrospective and part of a larger population included in SRD outcome results.[1,2] Consequently, longstanding concerns regarding the risks of abutment overload caused by frictional telescopic crowns (FTCs) have lingered.[3] The objective of this study was to report on the clinical outcomes of telescopic removable partial dentures (TRPDs) in a convenience sample of patients treated in a university department.

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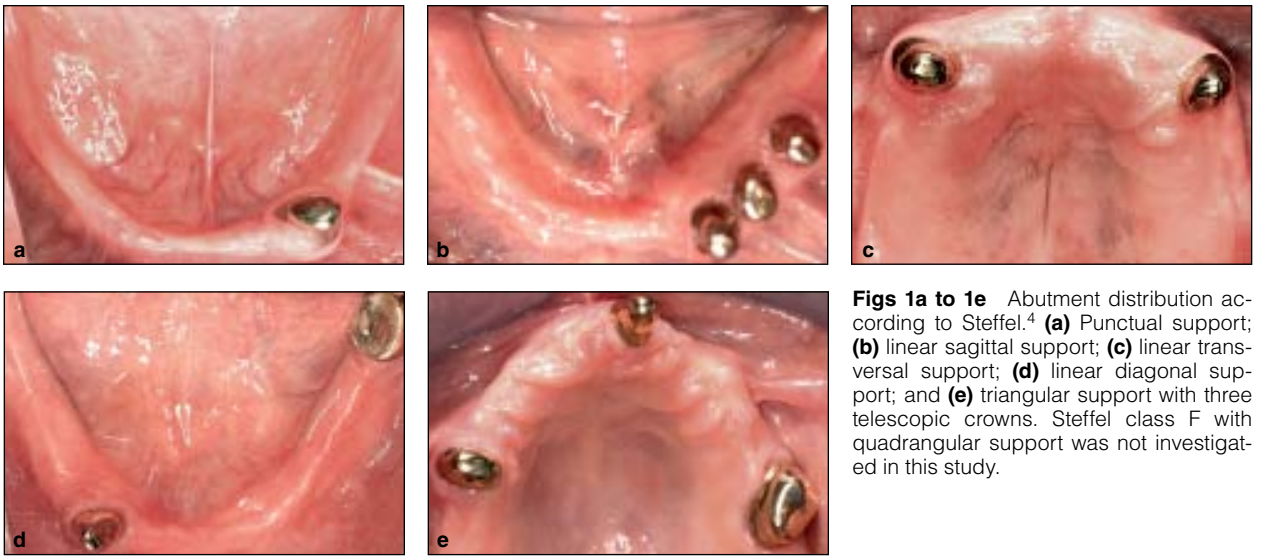
Materials and Methods

Between 2002 and 2004, 74 patients (41 men and 33 women, mean age: 66 years, age range: 40 to 84 years) with SRDs were treated with 82 TRPDs at the Department of Prosthodontics, Martin Luther University, Halle, Germany. TRPDs are the standard therapy for SRD patients, and every patient who asked for treatment received a TRPD (straightforward convenience-dictated selection). All dentures were constructed following the principle of total abutment tooth integration, which means that every remaining tooth was crowned with a telescopic crown. In total, 82 dentures were retained by 173 FTCs (90 canines, 37 premolars, 29 incisors, and 17 molars); 36 (43.9%) prostheses were inserted in the maxilla and 46 (56.1%) in the mandible.

The distribution of the telescopic abutment teeth (referred to as abutment teeth and abutment distribution/location, respectively) was based on the original Steffel classification[4] (Figs 1a to 1e), and following pretreatment baseline examination, patients and prostheses were reexamined every 6 months for a period spanning 60 months with strict recall; maintenance therapies were carried out as necessary. The original examinations as well as subsequent ones were performed by one examiner to ensure consistency of recordings.

Abutment tooth mobility was monitored using Periotest values (PTVs; Periotest, Medizintechnik Gulden) according to the standard method and references from the literature.[1] The ethics committee of Martin Luther University approved the study.



Figs 1a to 1e Abutment distribution according to Steffel.[4] **(a)** Punctual support; **(b)** linear sagittal support; **(c)** linear transversal support; **(d)** linear diagonal support; and **(e)** triangular support with three telescopic crowns. Steffel class F with quadrangular support was not investigated in this study.

Statistical evaluation was performed using SPSS 17.0 (IBM). Survival probabilities of telescopic crowns and abutment teeth were calculated using Kaplan-Meier estimators (log-rank test).

Relative risks for loss of telescopic crowns were determined using multifactorial Cox regression. The evaluation considered influencing factors such as age, sex, arch, number of telescopic crowns, abutment distribution, tooth vitality, end PTV compared to insertion PTV, opposing arch dentition, tooth axis inclination, crown length, wearing mode of the denture, crown margin quality, and tooth groups.

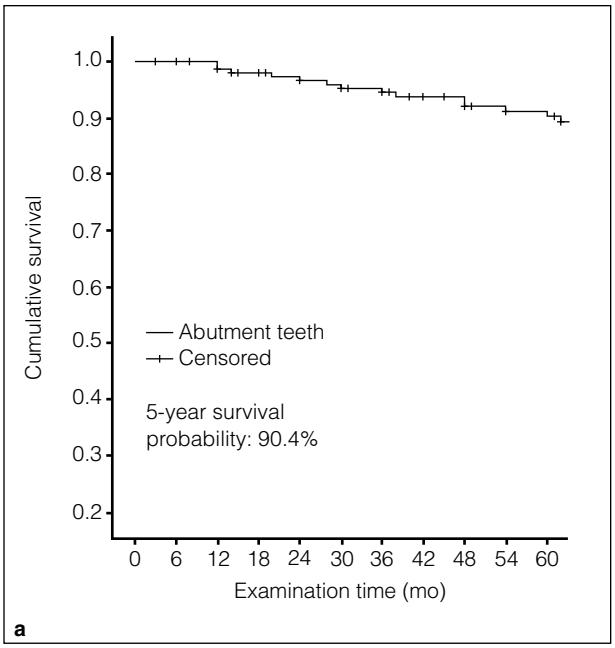
Descriptive statistics, analysis of variance, and general linear models (repeated measurements) were used. Population parameters (age, sex, and arch) were considered in multifactorial models, as well as potential data dependencies of teeth from the same patient with adjustments based on the number of patients and prostheses.

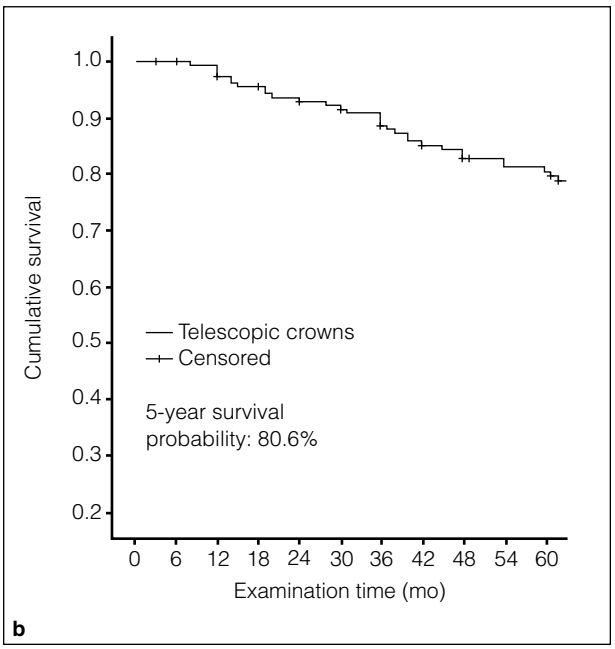
Results

Twenty-two of the 74 patients (29.7%) with 45 telescopic crowns (26%) were not included in the final data since 8 died, 7 became severely ill, 6 were not compliant, and 1 moved. Twenty-seven telescopic crowns (15.6%) in 17 patients (23%) were lost for the following reasons: 7 individual teeth had to be extracted after tooth fracture, 5 teeth were extracted for other reasons, and 15 crowns were lost after tooth fracture but the roots were retained and used for prosthesis support. The survival rate for telescopic crowns was therefore lower than that for abutment teeth (Figs 2a and 2b).

The following factors had a significant influence on telescopic crown survival: sex (male [73.7%] < female [89.0%], $P = .005$), tooth vitality (vital at insertion [88.4%] > nonvital at insertion [42.0%], $P < .0001$), and end PTV compared to insertion PTV (lower [88.7%] > higher [65.1%], $P = .0004$). The number of telescopic crowns (one [63.0%] < two [79.0%] < three [85.6%], $P = .075$) and arch (maxilla [75.0%] < mandible [85.5%], $P = .069$) also significantly influenced the recorded survival rates. The survival rates of the different Steffel classes[4] showed the following nonsignificant differences: class A (62.5%) < class C (73.6%) < class B (80.2%) < class D (83.3%) < class E (87.7%) ($P = .119$).

The data suggest prognostic factors for the survival of telescopic crowns and the relative risks (RRs) as shown in Table 1. Risks for Steffel classes A through D were significantly higher than those for class E (RR = 1). Survival curves for telescopic crowns influenced by abutment distribution ($P = .007$) are shown in Fig 3. PTVs of telescopic abutment teeth decreased significantly ($P = .001$). Patient satisfaction was high and increased significantly ($P = .003$). The number of telescopic crowns ($P = .021$), wearing mode ($P = .021$), and abutment distribution ($P = .05$) all affected satisfaction.





Figs 2a and 2b Kaplan-Meier survival curves for **(a)** abutment teeth (n = 173, 2 SE = 4) and **(b)** primary telescopic crowns (n = 173, 2 SE = 5.4).

Table 1 Results of Cox Regression for the Factor Abutment Distribution Adjusted for Age, Sex, Arch, and Tooth Vitality After 60 Months

Influencing factor	RR	SE	*P*	Significance†
Age (y)				
> 65	1.462	0.367	.301	NS
≤ 65	1.000			
Sex				
Male	2.978	0.408	.008	**
Female	1.000			
Arch				
Maxilla	3.430	0.366	.001	***
Mandible	1.000			
Vitality				
Nonvital	3.358	0.369	.001	***
Vital	1.000			
Abutment distribution				
Steffel class A	3.581	0.464	.006	**
Steffel class B	2.661	0.504	.054	*
Steffel class C	3.028	0.491	.024	*
Steffel class D	10.981	0.862	.005	**
Steffel class E	1.000		.007	**

RR = relative risk; SE = standard error.
*$P \leq .05$; **$P \leq .01$; ***$P \leq .001$; NS, not significant ($P > .05$).
†Level of significance, $\alpha = .05$; confidence interval = 95%.

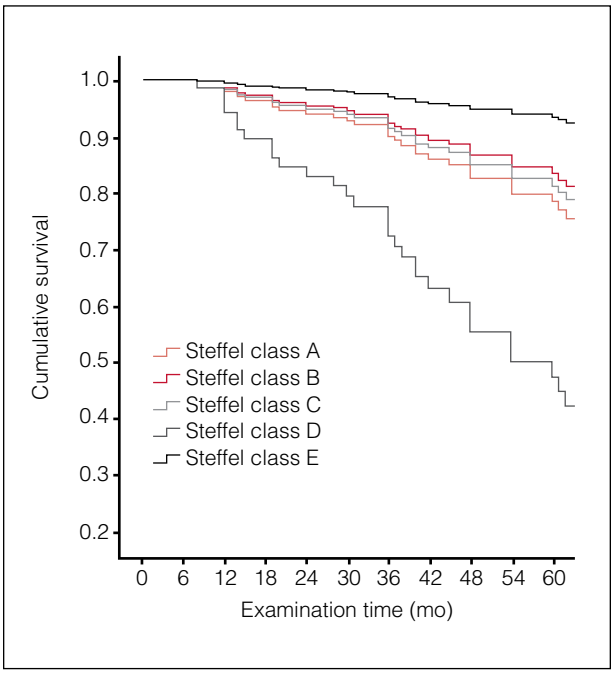


Fig 3 Survival curves (Cox regression) for telescopic crowns influenced by abutment distribution (Steffel classes) adjusted for age, sex, arch, and tooth vitality.

Discussion

The reported survival data are in accordance with those published.[1–3,5] The survival rates of FTCs in SRDs vary between 79% and 100%.[1] Data for FTCs from studies that did not only include patients with SRDs are similar (86.8% to 95.3%).[1] Survival rates were 73% to 94% for telescopic crowns with resilience and 59.3% to 96.7% for conus crowns.[1] The current data fit well into these published data, with lower survival rates for telescopic crowns in males[1] and on nonvital teeth[3,6] and those on abutment teeth with decreasing mobility having a higher survival rate. Survival probability increased with the number of telescopic crowns employed ($P = .075$).[1,2] After adjustments for risk factors (Cox regression), Steffel classes showed significantly different risks, with the risk of loss of telescopic crowns in dentitions with Steffel class E smaller than that of all other classes.[1]

The most successful outcomes had telescopic crowns in females with vital mandibular teeth in triangular support. These results suggest that the retention of even weaker or nonvital teeth actually improves denture support[1,2,6] and that the presumed and increased risks in SRDs[1,3] have to be seen in relation to the unfavorable initial dental situation of the patients to be treated and the benefit to the patient after treatment.[1]

Decreased PTVs[1] were not caused by loss of loose teeth, and survival rates of abutment teeth with an initial PTV < 8.3 (median) and an initial PTV > 8.3 (median) demonstrated relatively insignificant differences.These results appear to confirm the published data on tooth mobility behavior[1] but not the concerns of tooth overload.[3]

Subjective patient reports also indicated that diurnal and nocturnal prosthesis users and those with three-telescope prostheses comprising triangular distribution or canines as abutment teeth were the most satisfied groups in this report.

Conclusions

The results of this report should be interpreted with caution since this was not a controlled study and it lacked external validity and demonstrated a high patient dropout rate. Moreover, the inherent limitations of reporting a specific clinical intervention in any case series demand that the conclusions be interpreted with caution. Given this context, it remains reasonable to suggest the following:

- Prostheses supported by FTCs offer an effective treatment alternative for patients with SRDs who do not want implant treatment or complete dentures. This protocol appears to be feasible when strict recalls (every 6 months) and a rigorous maintenance program are followed. The technique's documented favorable clinical outcomes of comfort and satisfaction combined with good (unlimited) repair capability are particularly encouraging.
- The risk of loss of telescopic crowns depends significantly on abutment tooth distribution, and the retention of weaker or nonvital teeth may be employed to improve and enhance abutment support.
- A general increase in tooth mobility and abutment tooth overload was not observed in the selected abutments for the specific population group studied.

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