

SURVIVAL AND PROSTHETIC SUCCESS OF FIXED PARTIAL DENTURES SUPPORTED BY EITHER ABUTMENT TEETH OR IMPLANTS: A RETROSPECTIVE STUDY

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Abstract

The study aimed to determine the survival and success rates of the metal-ceramic fixed partial dentures with support on natural teeth versus dental implants as well as in relation to demographic and individual patients' parameters. Materials and method. The research was designed as a retrospective study including 126 edentulous patients (mean age $60,48 \pm 11,459$ yr; 46- males, 80- females) treated by fixed partial dentures (FPD) either with natural teeth or dental implants support. The patients were divided in two study groups: 74 patients with 88 implants-supported FPD; 52 patients with 64 teeth-supported FPD. The survival and prosthetic success rates were calculated for each study group as well as in relation to demographic and individual patients' parameters. Results. Survival rates were 90,6% for teeth-supported FPD and 93,2% for implant-supported FPD. Prosthetic success was 63,6% for teeth-supported FPD and 75% for implant-supported FPD. Conclusions. Similar survival rates and higher rates of prosthetic success (without significant statistical differences) were recorded for implant-supported FPD comparing to teeth-supported FPD patient.

Key words: *fixed partial dentures, teeth support, implant supports, survival rate, prosthetic success*

INTRODUCTION

The therapeutic complexity of the clinical cases with partial edentulousness involves the etiopathogenic individualization of the cases and completion through fixed partial dentures (FPD) with support on natural teeth or dental implants (Forna, 2011). However, not every patient is a candidate for dental implants, in the context where severe bone loss associated with complex medical history are risk factors for the success of implant-prosthetic therapy (Pol et al, 2022). Fixed partial dentures with teeth support involve the preparation of the adjacent teeth adjacent, a process that makes these abutment teeth more prone to the accumulation of bacterial plaque, tooth decay or periodontal disease, or even to the periapical pathology following endodontic

treatment (Pjetursson et al, 2018). Fixed partial dentures with implant support have advantages of avoiding the involvement of adjacent teeth and preventing alveolar bone loss. Although multiple risk factors can decrease the probability of teeth survival, the survival and success rates of dental implants are inferior to the survival rates of healthy natural teeth, considering the risk of implants biological and technical complications (Pjetursson et al, 2007, 2012; Pol et al, 2018, 2022).

AIMS OF STUDY.

- Comparison of the survival and prosthetic success rates of the metal-ceramic FPD with support on natural teeth versus dental implants;
- Evaluation of the survival and prosthetic success rates of the metal-ceramic FPD (with support

either on natural teeth and implants) in relation to individual patients' parameters.

MATERIALS AND METHODS.

The research was designed as a retrospective study including 126 edentulous patients (mean age 60,48 ± 11,459 yr ; gender 46/80) treated by metal-ceramic fixed partial dentures with natural teeth or dental implants support. Inclusion criteria: age >18 years; reduced posterior edentation; prosthetic treatment with metal-ceramic FPD with centric pontic or cantilever type; follow-up >5 years from prosthetic reconstruction. Exclusion criteria: systemic pathology that could affect abutment teeth or implants (non-controlled diabetes, osteoporosis, metabolic disorders); patients non-compliant to periodontal maintenance sessions. The study was performed accordingly to the requirements of the 1975 Helsinki Declaration revised in 2008 and CONSORT Guidelines. Written informed consent was obtained from all patients before enrollment. The patients were divided in two study groups:

- Study group A (n=74)-metal-ceramic implants-supported FPD (n=88);
- Study group B (n=52)-metal-ceramic teeth-supported FPD (n=64)

The data regarding biological complications of abutments and FPD and mechanical/technical complications of FPD were collected from patient files and radiographic exams. All patients were examined during the yearly regular visit for FPD, abutments, surrounding hard and soft tissues and patient satisfaction. The prosthetic success rates were calculated for each study group as well as in relation to demographic and individual patients' parameters. A surviving FPD is defined as the FPD remaining in situ with or without modification for the entire monitoring period (Sailer et al, 2018).

Features of the study groups (parameters of patients and fixed partial dentures) are exposed in tables I and II. There were no significant differences in demographic parameters (gender, age groups) both in overall patients and between study groups.

Table I. Study groups features- demographic and individual parameters
(Group A- Teeth-supported FPD vs. Group B- Implant-supported FPD)

	Study group A	Study group B	Total	p
Ns (%)	74 (58,7%)	52 (41,3%)	126 (100%)	
Age, m ± SD	58,35 ± 11,228	63,50 ± 11,203	60,48 ± 11,459	
Age group, Ns(%)				,086
40-60 yr	34 (45,9%)	16 (30,8%)	50 (39,7%)	
>60 yr	40 (54,1%)	36 (69,2%)	76 (60,3%)	
Gender, Ns(%)				,262
M	30 (40,5%)	16 (30,8%)	46 (36,5%)	
F	44 (59,5%)	36 (69,2%)	80 (63,5%)	
Smoking, Ns(%)				,647
No	54 (73,0%)	36 (69,2%)	90 (71,4%)	
Yes	20 (27,0%)	16 (30,8%)	36 (28,6%)	
Periodontal disease history, Ns(%)				,009**
Yes	34 (45,9%)	12 (23,1%)	46 (36,5%)	
No	40 (54,1%)	40 (76,9%)	80 (63,5%)	
Oral hygiene (mPI), Ns(%)				,005**
0	28 (37,8%)	26 (50,0%)	54 (42,9%)	
1	20 (27,0%)	22 (42,3%)	42 (33,3%)	
2	16 (21,6%)	2 (3,8%)	18 (14,3%)	
3	10 (13,5%)	2 (3,8%)	12 (9,5%)	

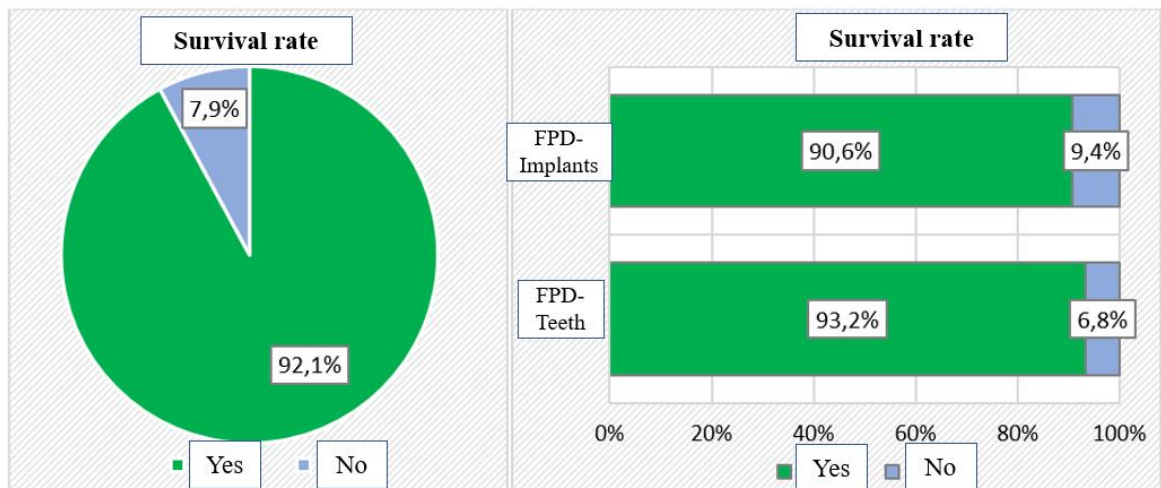
Table II. Study groups features- parameters of fixed partial dentures
(Group A- Teeth-supported FPD vs. Group B- Implants-supported FPD)

	Study group A	Study group B	Total
Ns (%)	88 (57,9%)	64 (42,1%)	152 (100%)
Fixed prostheses, Ns(%)			
Classic FPD	80 (90,9%)	54 (84,4%)	134 (88,2%)
FPD- cantilever type	8 (9,1%)	10 (15,6%)	18 (11,8%)
Units number (report abutment/pontic), Ns(%)			
Cantilever FPD 2/1 (D)	2 (2,3%)	-	2 (1,3%)
Cantilever FPD 2/1 (M)	4 (4,5%)	-	4 (2,6%)
Cantilever FPD 2/3 (M)	2 (2,3%)	-	2 (1,3%)
Classic FPD 3 (2/1)	52 (59,1%)	38 (59,4%)	90 (59,2%)
Classic FPD 4 (2/2)	18 (20,5%)	4 (6,3%)	22 (14,5%)
Classic FPD 4 (3/1)	8 (9,1%)	20 (31,3%)	28 (18,4%)
Classic FPD 5 (2/3)	2 (2,3%)	-	2 (1,3%)
Classic FPD 5 (4/1)	-	2 (3,1%)	2 (1,3%)
Follow-up (yr), Ns(%)			
5-10	32 (36,4%)	46 (71,9%)	78 (51,3%)
>10	56 (63,6%)	18 (28,1%)	74 (48,7%)
Location, Ns(%)			
MD	58 (65,9%)	32 (50,0%)	90 (59,2%)
MX	30 (34,1%)	32 (50,0%)	62 (40,8%)
Location (quadrant), Ns(%)			
1	16 (18,2%)	12 (18,8%)	28 (18,4%)
2	14 (15,9%)	20 (31,3%)	34 (22,4%)
3	22 (25,0%)	14 (21,9%)	36 (23,7%)
4	36 (40,9%)	18 (28,1%)	54 (35,5%)

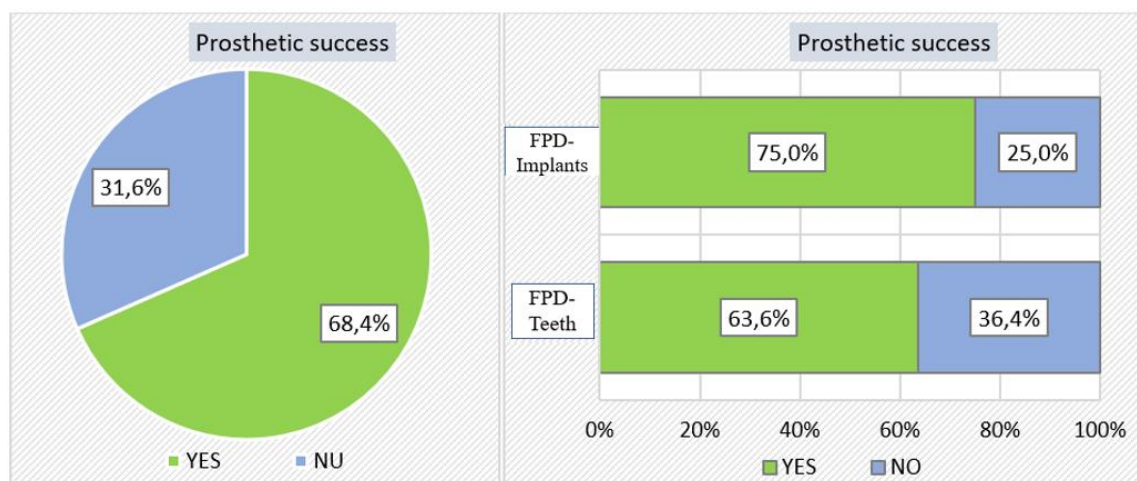
RESULTS

Survival rates were 92,1% for overall patients (fixed partial dentures supported by abutments either teeth or implants) (fig. 1.a). Survival rate of teeth-supported FPD was 90,6% while survival rate of implants-supported FPD was 93,2% (fig. 1.b). The prosthetic success was 68,4% for overall patients (fixed partial dentures supported by abutments either teeth or implants) (fig. 2.a). The prosthetic success of teeth-supported FPD was 63,6%, while

prosthetic success of implants-supported FPD was 75% (fig. 2.b). The statistical analysis found the absence of significant statistical differences between the group of teeth-supported FPD and implant-supported FPD, regarding the rates of survival ($p=0,564$) (Table I). The statistical analysis found the absence of significant statistical differences between the group of teeth-supported FPD and implant-supported FPD, regarding the prosthetic success ($p= 0,137$) (Table II).



Figures 1.a-b. Survival rates (overall; teeth-supported FPD; implants-supported FPD)



Figures 2.a-b. Prosthetic success (overall; teeth-supported FPD; implants-supported FPD)

Table I. Rate of survival (teeth-supported FPD vs. implant-supported FPD)

Survival, Ns(%)	Group A (teeth-supported FPD)	Group A (implant-supported FPD)	Total	Pearson Chi-pătrat	p
YES	82 (93,2%)	58 (90,6%)	140 (92,1%)	,333	,564
NO	6 (6,8%)	6 (9,4%)	12 (7,9%)		

Table II. Rate of prosthetic success (teeth-supported FPD vs. implant-supported FPD)

Prosthetic success, Ns(%)	Group A (teeth-supported FPD)	Group A (implant-supported FPD)	Total	Pearson Chi-pătrat	p
YES	56 (63,6%)	48 (75,0%)	104 (68,4%)	2,214	,137
NO	32 (36,4%)	16 (25,0%)	48 (31,6%)		

DISCUSSIONS

Our research aimed to compare survival and prosthetic success of the FPD supported by either natural teeth or dental implants. The prosthetic success was considered for surviving FPD without complications. This definition of the prosthetic success is valid despite the recommendation of some research group for using USPHS modified criteria (Pol et al, 2022; Spies et al, 2018; Naenni et al, 2015). In both classification systems, the prosthetic success is considered when FPD are free of framework fracture, veneering fracture/chipping, loosening of the restoration, loss of screw access hole, occlusal wear, poor marginal adaptation, poor anatomical form. The inclusion of patients treated by same practitioner allowed the evaluation of subjects treated by a standardized protocol. There is a large amount of information on dental implant-supported restorations, in contrast to the limited information available on the clinical performance of teeth-supported

restorations. A few reviews (Le et al, 2015; Pjetursson et al, 2018) highlighted the fact that a small number of studies compared the survival and success rate of the FPD with teeth support versus implants support (Pjetursson et al, 2004, 2007; Pol et al, 2022).

Our results showed non-significant statistical differences between the survival rates of the two categories of FPD, while prosthetic success was higher for implant-supported FPD. These results support data reported by of Pol et al (2018, 2022) regarding the similar clinical performance of fixed partial dentures supported by abutments either teeth or dental implants. Also, a review by Sailer et al (2018) reported, for an estimated 5-year complication rate for metal-ceramic FPD, a total complications rate of 15.1%; 84.9% of the metal-ceramic implant-supported FPD were free of biological or mechanical/technical complications at the end of the monitoring period. In our study, total complications rate of implant-supported FPD was 25%; the higher mean

value can be explained by higher follow-up period, as 71,9% of FPDs were assessed after 5-10 year of follow-up, and 28,1% had a follow-up >10 year. For a mean follow-up of 41 months, Pol et al (2018) reported a 99% survival rate for teeth-supported FPD, and 98,7% survival rate for implant-supported FPD. A second study (Pol et al, 2022), with a mean follow-up of 52 months, found out a 91,7% survival rate for teeth-supported FPD, and 100% survival rate for implant-supported FPD. Survival rates recorded in our study were lower (90,6% for teeth-supported FPD; 93,6% for implant-supported FPD). Two factors can contribute to these differences: higher mean follow-up of prosthetic reconstructions in our study (36,4% 5-10 yr follow-up; 63,6% >10 yr follow-up); 3-units FPD (Pol et al, 2022) vs. 3-5 units FPD in our personal study. For higher mean follow-up, Tallarico et al. (2018) reported 89,2% 10-year survival of teeth supported FPD and 86.7% 10-year survival of implant-supported FPD. The survival rates of teeth-supported FPD decreased gradually with time at (Bart et al, 2012). A systematic review of Heydecke et al (2012) regarding studies performed on 2-4 implants FPD, reported a survival rate of 98.9% (98.5–99.3%) at 5 years and a 97,8% survival rate > 10 years (96.9–97.6%).

Using modified USPHS criteria, Pol et al (2022) reported 87,5% prosthetic success (scores Alpha and Bravo) for implant-supported FPD and 91,7% prosthetic success for teeth-supported FPD. In our study, prosthetic success rates were lower for both FPD categories (75% for implant-supported FPD, 63,6% for teeth-supported FPD). The factors reminded previously can also contribute to the differences between rates of prosthetic success. Tallarico et al. (2018) reported in a

systematic review as follows: 10-year survival of teeth supported FPD was 89.2% compared to 86.7% for implant-supported fixed partial prosthetic restorations. Despite the high survival rates, Tallarico et al (2018) reported frequent biological and technical complications in the case of 10-year survival implant-supported FPD (38.7%) when compared to teeth-supported FPD (15.7%). Bart et al (2012) evaluated biological and technical complications for teeth-supported FPD with 7-19 years (mean: 14 years). It was reported high survival rates (90.4% at 10 years; 80.5% at 15 years). 79,7% of all FPD remained free from any complication/failure at 10 years and only 34.6% at 15 years. The research group concluded that freedom from complications and failures was drastically decreased for teeth-supported FPD in function for longer than 10 years (Bart et al, 2012). The selection of the fixed prosthetic solution must take into account multiple factors that can lead to failure (incorrect/incomplete assessment of the patient, non-compliance with the operating and maintenance protocol, failure to identify some risk factors as history of periodontitis/smoking, incorrect choice of the implant type, biomechanical features). In the interpretation of the results reported by various systematic reviews of the literature regarding the clinical performance of fixed prosthetic treatment (supported by either abutment teeth, or dental implants), the definitions of success and survival, respectively the criteria used to evaluate the data differ greatly between different studies (Meijer et al, 2007; Patel et al, 2014). The variations in the definitions of "survival" and "success" prevent reliable interpretations of data as well as meaningful direct comparison of the results

of fixed dental prosthetic treatments (Meijer et al, 2007; Patel et al, 2014). Prosthetic success rate can be overestimated, considering fixed prosthetic restorations that are found in situ but need replacement (Needleman et al., 2012). Regarding data interpretation, we must consider some limits specific to a retrospective study (possible incomplete recorded data from patients' files), large follow-up period as well as the absence of radiographic comparisons between periodontal and peri-implant soft tissues.

CONCLUSIONS

- Survival rates of teeth- and implants-supported FPD were high (93,2% vs. 90,6%, respectively) for

both categories of prosthetic restorations. differences.

- Higher rates of prosthetic success were recorded for implant-supported FPD (75%) comparing to teeth-supported FPD patients (63,6%).
- Implant-supported fixed prosthetic restorations are a valid therapeutic solution in patients with short edentation and poor prognostic of abutment teeth.

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