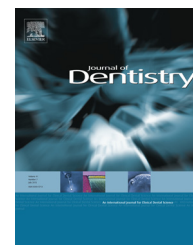


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Short communication

Clinical performance of cantilevered fixed dental prostheses abutments in the shortened dental arch[☆]



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ABSTRACT

Objectives: This article is part of a randomized clinical trial on different treatments in the shortened dental arch (SDA). It focused on the abutment tooth prognosis with cantilevered fixed dental prostheses (CFDPs).

Methods: Sixty-two patients with a bilaterally SDA up to the first or second premolar in the mandible or maxilla were evaluated. In 57 of 124 quadrants, second premolars were replaced by a CFDP (cantilever group). In the remaining 67 quadrants, a natural second premolar was present and thus no need for a CFDP was given (non-cantilever group). Patients were recalled annually up to 5 years.

Results: The mean observation period was 56.3 months (min. 3.0, max. 76.2, SD 16.1). Kaplan–Meier survival rates concerning tooth loss and tooth fracture were 93.9%/94.0% in the cantilever group and 91.9%/92.8% in the non-cantilever group. Differences between both groups were not significant. The survival rate concerning loss of retention of CFDP retainers was 92.1% in the cantilever group.

Conclusion: After 5 years of clinical service, CFDPs for the replacement of the second premolar showed no negative impact on the abutment tooth prognosis.

Clinical significance: Cantilevered fixed dental prostheses present a viable treatment option in the shortened dental arch without compromising the medium-term abutment tooth prognosis.

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1. Introduction

Back in 1981 research results already showed that oral functions (number of chewing strokes needed for swallowing

increases) change slowly with a decreasing number of occlusal units until there are at least 4 occlusal units left in a dentition.¹ Patients started to complain about their masticatory functions when the number of occlusal units was less than 4 in a symmetrically shortened arch. Based on these findings the

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treatment concept of the shortened dental arch (SDA)² with the non-replacement of molars has been widely accepted by the professional community as an adequate treatment approach whilst the benefit of removable dental prostheses (RDPs) for mere molar replacement is controversial.^{3,4} In some patients a RDP replacing missing molars might enhance masticatory functions and improve the patients oral health related quality of life.⁵ On the other hand is the improvement of the patients oral health related quality of life by a RDP not predictable and the RDP might also cause damage to the abutment teeth and supporting tissues due to higher stress levels. An increase in treatment costs, more maintenance and more frequent repair also comes along with RDP treatment.

The randomized shortened dental arch study was designed to evaluate in patients with a complete loss of molars the efficacy of the treatment with RDPs for molar replacement compared to a FDP treatment not replacing any molars (SDA group).⁶ In cases with a missing second premolar, the principles of the SDA concept made a treatment with a cantilevered fixed dental prosthesis (CFDP) necessary. Implant supported restorations were not included in the study.

Since randomized clinical trials on the outcome of CFDPs are lacking this article is presenting part of a larger multicentre study and evaluated the SDA group in order to gain information on how abutments of CFDPs perform.

Different studies described inferior success and survival rates for CFDPs compared to conventional fixed dental prostheses (FDPs).^{7,8} Based on these findings, the hypothesis of this analysis was that the survival rate of CFDP abutments in the canine and premolar region is inferior compared to the survival rate of respective teeth without CFDPs.

2. Materials and methods

Patients over 35 years of age with all molars missing in one jaw and with at least both canines and one premolar left on each side were eligible to enter this 14-centre randomized controlled trial. The study design was approved by the Institutional Review Board (TU Dresden, EK 260399). All patients gave written informed consent before entering the study.

In the SDA group, tooth-borne metal-ceramic FDPs were used for replacement of missing teeth. Any missing second premolar was replaced with a CFDP. No prosthetic treatment was performed if the shortened dental arch was complete up to the second premolar. Clinical and laboratory procedures were standardized according to a detailed study protocol.⁶

Overall, 215 patients were enrolled in the main trial. One hundred and six patients were assigned to the SDA group. The primary outcome measure in the main trial was tooth loss. The secondary outcome measures included clinical, technical and subjective variables amounting to a total of 21 variables described in detail in the study design and protocol publication.⁶

The main trial sample size was determined by calculating to reach a power of 75% at a two sided .05 significance level. The expected tooth loss was presumed to reach 20% with RDP treatment and 5% with SDA treatment. With a scheduled two-year recruitment period and a five-year follow-up period the calculated number of patients required, therefore amounted

to a total of 70 patients per treatment group. Further details concerning presumptions and sample size calculation as well as details on the randomization have already been published.⁶ The randomization took place centrally at the biometrical centre of the University of Münster. Regarding this article, the total available sample size ($n = 124$) was determined by the main trial and the calculated power to be reached with this sample size was $1 - \beta = 0.80$ with $\alpha = 0.05$ and effect size $\delta = 0.1$ at an estimated control group event rate of 5%.

CFDP abutments received a chamfer preparation whilst the frameworks were made of high noble alloys. Feldspathic porcelain materials were used for veneering of the frameworks and to achieve an ovate pontic form on the basal aspect.

Out of the 106 randomized patients in the SDA group, 69 patients actually underwent the respective treatment in the upper or lower jaw. Only canines and premolars were included in the analysis. Quadrants were regarded separately. Five patients who received wide span CFDPs extending to the contralateral side and two patients who switched treatment within the first year after insertion were excluded. Therefore, a total number of 124 quadrants in 62 patients could be evaluated. Of these 124 quadrants, 57 were restored with a CFDP (cantilever group) whereas 67 quadrants did not receive a cantilevered restoration (non-cantilever group). In the cantilever group, the canine and the first premolar were abutment teeth. In the non-cantilever group, in 8 quadrants the missing first premolar was replaced by an FDP extending from the canine to the second premolar. In 59 quadrants, the canine and both premolars were present. In 14 of these 59 quadrants, none of these teeth were crowned.

The primary outcome measure within the conducted analysis was tooth loss. Secondary outcome measure variables in this particular part of the larger study were reduced as compared to the main trial to tooth fracture and loss of retention of CFDP retainers. These secondary outcome measure variables were, amongst others, part of the main trials secondary outcome measures. Fractures were defined as the coronal part of a tooth being fractured off the root at gingival level. Statistical analysis encompassed Kaplan–Meier survival analyses⁹ and Mantel–Cox log-rank tests (SPSS 16 Software, SPSS Inc., Chicago, USA)¹⁰ for comparisons.

3. Results

The mean observation period amounted to 56.3 months (min. 3.0, max. 76.2, SD 16.1). Eight tooth losses, 7 tooth fractures and 4 losses of retention occurred.

Of the 8 tooth losses, 3 occurred in the cantilever group (5.3% of the respective quadrants) and 5 losses (7.5%) occurred in the non-cantilever group. The eight teeth lost were extracted either because of fracture ($n = 5$, 62.5%) or because of caries or periodontal problems ($n = 3$, 37.5%).

Three fractures were found in the cantilever group (5.3%) two of which lead to tooth loss. Four fractures were found in the non-cantilever group (6.0%) three of which lead to tooth loss. All the mentioned tooth fractures were not repairable except for the two cases in which a cast post and core was made and the tooth could be saved. The reason for the teeth to fracture could not be determined for sure. Fracture causes

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