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**Original Research**

# Survival analysis of the splinted periodontally compromised teeth during the periodontal therapy

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**Abstract**

**Objectives**: This retrospective study assessed the survival of the splinted periodontally compromised teeth during the periodontal therapy.

**Methods:** Data from the patients who received the splints from a period of 2019 to 2020 taken in a university setting were retrospectively analysed. Survival of the splinted teeth, splint fractures and splint repairs were assessed in the follow-up data available during the period. Kaplan-Meier Survival analysis was done.

**Results:** Forty patients with 232 splinted teeth were followed for an average follow-up period of 8.5±2.5 months (range: 2-11months). Only one tooth got extracted during the follow-up. 32 out of 232 teeth (13.8%) required splints repairs because of fractures and dislodgments. The survival rate of the splinted teeth during the follow-up period was found to be 99.6%.

**Conclusion:** Splinting significantly improved the survival time of the periodontally compromised teeth during this limited follow-up period. But the prospective analysis of the survival rate is required for the future studies.

*Keywords: Survival Analysis, Splinting, Periodontally compromised teeth*

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## INTRODUCTION

Periodontitis leads to progressive loss of attachment of the teeth resulting in increased tooth mobility and eventually tooth loss. The comfort, esthetics and function of these teeth for the patients are also compromised subsequently. [1] Splinting of these affected teeth provides the better option for the increasing function and comfort of the patient. It often prevents extraction of tooth and complex rehabilitation of the lost structures. But this decision making has become challenging in the recent times with more advent of implants and splinting of these teeth with compromised periodontium becomes ardent for both the clinicians and patients. The patient's overall circumstances and treatment expectations should always be taken into account while making this decision.

Periodontal splints can be provisional or permanent depending the status of occlusion and patients' requirements. Currently, there are various techniques been employed for periodontal splinting are external and internal fixed splints made from composite resin with fibre or wire reinforcement. These splints are rigid and do not stimulate bone remodelling in a periodontium that is already damaged. Elastic splints are often preferred as they allow for the physiologic mobility. [2] There are still wide limitations in the data reporting of long term stability and survival of the splinted teeth in the patients with periodontitis. The prognosis of the same remains still controversial. [3] The aim of the present study is to evaluate the survival of the splinted periodontally compromised teeth during periodontal therapy and evaluation of tooth loss rate during the therapy.

### Materials and Methods

Patients who were undergoing periodontal therapy with previously splinted teeth were considered. The present study was done under a university setting approved by the University Review Board. Retrospective study was carried out by collecting all the clinical patient records who underwent Splinting of the periodontally compromised teeth during the periodontal therapy at the dental college teaching post graduate clinic between 2019 and 2020. All the relevant digital information was analysed by the author.

### Eligibility criteria

Patients were included in the study if they underwent splinting procedure in the dental college setting with the following inclusion criteria: existence of fiber or metal reinforced composite splint of 2-6 periodontally compromised teeth during the periodontal therapy. The exclusion criteria included were: Incomplete charts; Cross bites; oral parafunctions.

### Data Collection

Data was collected from the Dental Information Archiving Software (DIAS) record for the teaching institute. It is a online method for keeping track of all patient information, including periodontal charts, treatment records and patient related images. All the cases in the mentioned time period with both radiographic and photographic data available would be considered.Splinted teeth survival would be decided if the teeth was extracted or not in the recent follow-up. From the day of the splinting treatment (the baseline) through the most recent appointment demonstrating that the tooth had survived, the survival time was computed. The splint repairs required would also be recorded.

**Statistical Analysis**

The Kaplan-Meier estimator was used in a survival analysis to determine the cumulative survival rates at various time points. SPSS software version 24.0 was used to conduct all statistical analyses. The survival plot was created based on Kaplan-Meier analysis with their estimated confidence interval. ANOVA test was done to compare the survival time and probing pocket depth of various teeth.

**Results**

Based on the eligibility criteria, data from forty patients undergoing periodontal therapy were added in the study. From the 40 patients' data (23 males, 17 females) with a mean age of 40 years, 232 splinted teeth records were obtained. The average follow-up data included in the study is 8.5±2.5 months (range: 2-11months). The demographic data of the study is shown in the table 1. At baseline, 33 patients were diagnosed with chronic periodontitis (82%) and 7 patients were diagnosed with localized/generalized aggressive periodontitis (18%). Out of 232 splinted teeth, 96 teeth (41.4%) were Mandibular incisors, 47 teeth (20.3%) were Mandibular canines, 37 teeth (15.9%) were maxillary incisors, 20 teeth were maxillary canines, 12 teeth were mandibular premolars (5.2%), 10 teeth were maxillary premolars (4.3%) and 5 teeth each belonged to maxillary and mandibular molars (2.2%) (Figure 1). All the splints were inserted before the surgical flap debridement. 39 out of 40 splints (98.7%) were made with composite resin materials reinforced by orthodontic wire and only one splint (1.3%) was made with composite resin materials reinforced by fibre-glass core. Repair of the splints and splint dislodgement accounted for 32 out of 232 teeth (13.8%) (Table 2) during the follow-up.

No splinted tooth was lost within the first 3 months after splinting during the periodontal therapy. One splinted tooth was lost after the third month from the baseline follow-up. The splint fracture and grade 3 mobility of the tooth were the reasons for the tooth failure. The mean probing pocket depth (PPD) for the survived splinted teeth was 4.5±1.7 mm. Since the failed splinted teeth were only one. The statistical analysis could be performed for the PPD (Figure 2, Table 3).

The survival rate of the splinted teeth during the periodontal therapy was found to be 99.6% and the failure rate of 0.4% accounted to the single splinted tooth loss (Figure 3, Table 2). The mean survival time of the survived splinted teeth was 8.5±2.5 months. The mean survival time of wire composite splint was 8.5±2.5 months and Fiber composite splint was 8 months. Statistical significance was found between the two groups ($p=0.03$). The mean survival times of the various tooth are given in the table 3 (Figure 2). The survival rate of splints after 6 months follow-up from baseline was found to be 86.2%, survival rate after 8 months of follow-up was 75.86% and survival rate after 10 months follow-up was 45.69% (Figure 4). No statistical significance could be determined in the difference in the survival and failure rate between the various tooth, splinting materials and demographic data.

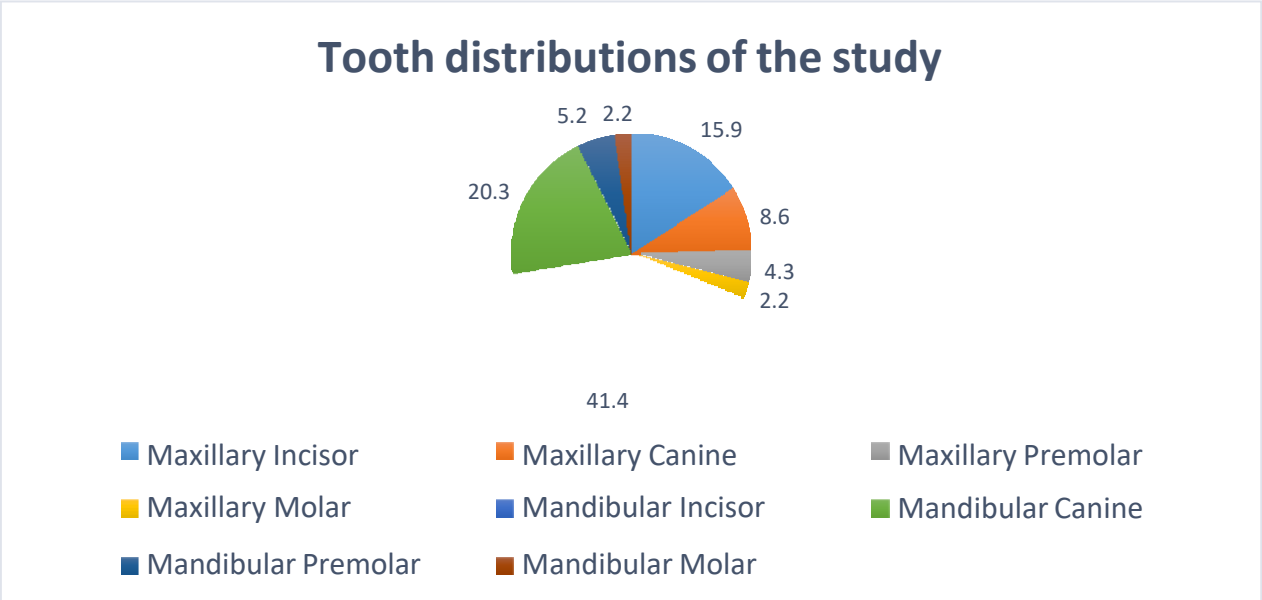


Figure 1 Distributions of the various teeth included in the study group

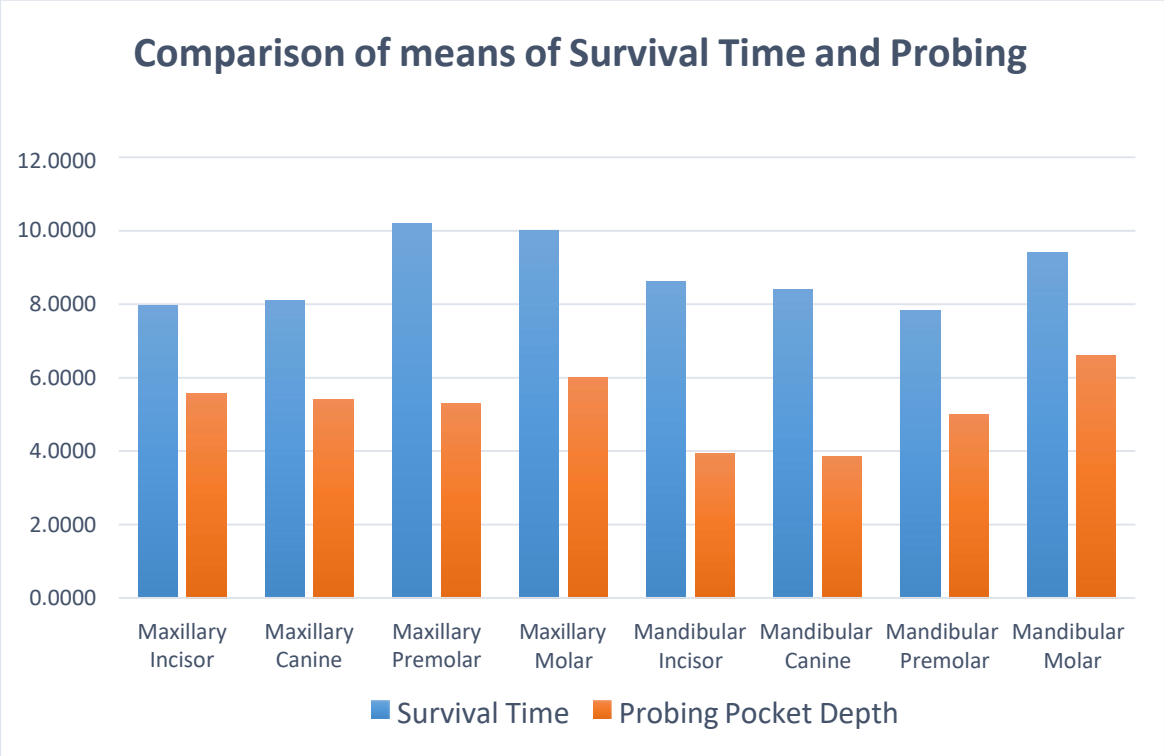


Figure 2- Comparison of means of survival time and probing pocket depth of the various teeth. There was no significant difference in the mean of survival time of the various teeth but the probing pocket depth was varying significantly with p value – 0.000 signifying that the PPD was greater in the mandibular and maxillary molars.

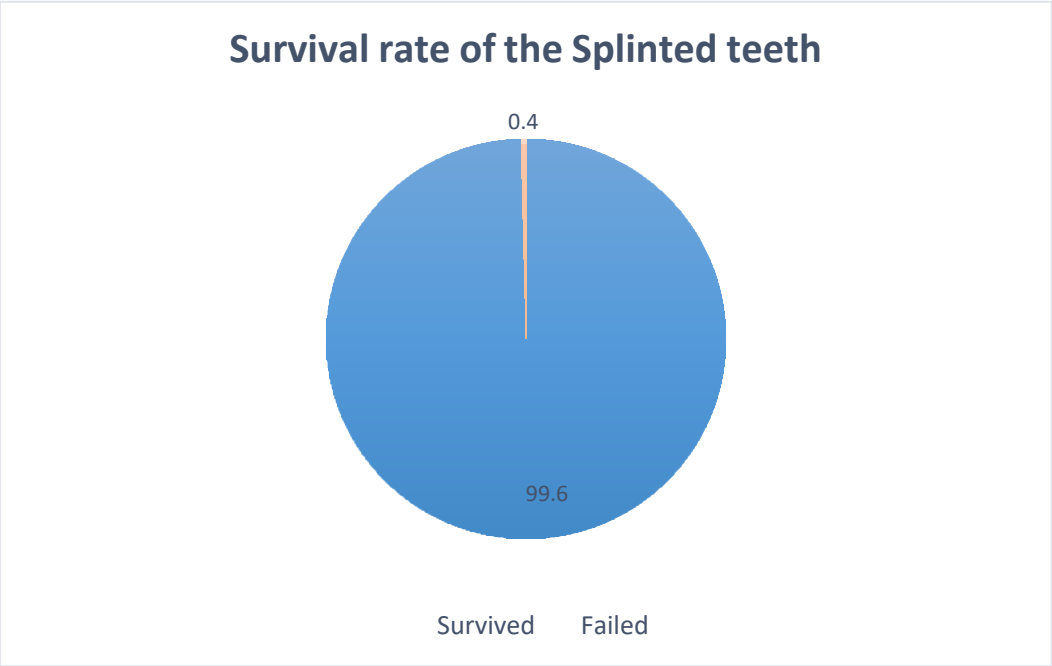


Figure 3- Survival rate of the splinted teeth

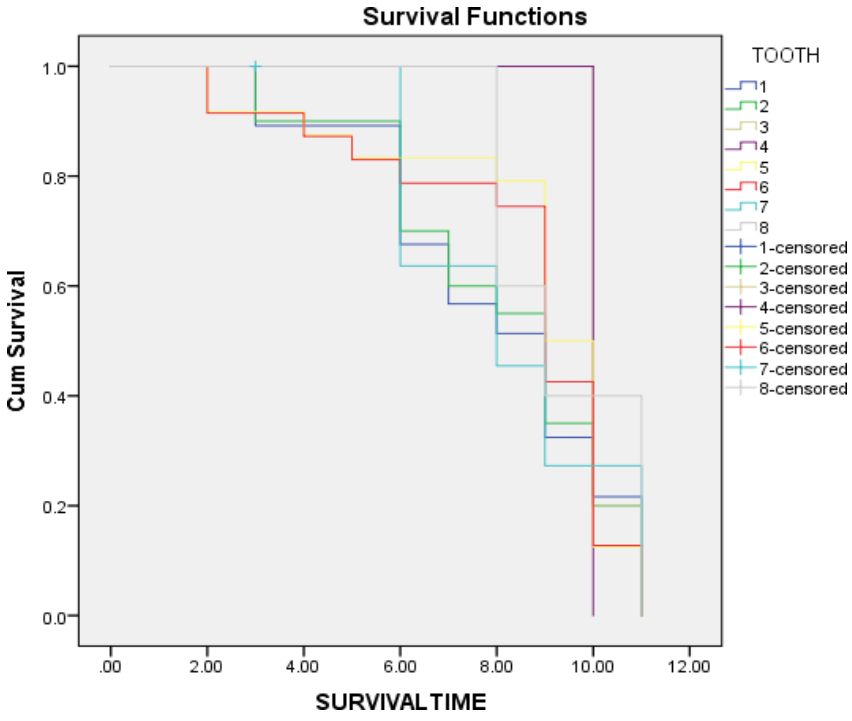


Figure -4 - Cumulative Survival Analysis of the various splinted teeth over the follow-ups where 1-Maxillary Incisor; 2-Maxillary Canine; 3- Maxillary Premolar; 4-Maxillary Molar; 5-Mandibular Incisor; 6-Mandibular Canine; 7-Mandibular Premolar; 8-Mandibular molar

Table 1: Demographic Data

| | | N | Percentage |
|---|---|---|---|
| Sex | Male | 23 | 57.5 |
| | Female | 17 | 42.5 |
| Mean ± S.D. of Age | | 40±10.1 | |

Table 2- Splint Repairs and Survival data

| | | Frequency | Percent |
|---|---|---|---|
| Splint Repairs | Not Required | 200 | 86.2 |
| | Required | 32 | 13.8 |
| | Total | 232 | 100.0 |
| Survival | Survived | 231 | 99.6 |
| | Failed | 1 | 0.4 |
| | Total | 232 | 100.0 |

Table 3: Comparison of Means of Survival time and Probing Pocket Depth (PPD) of various tooth

| Parameters | Tooth | Number | Mean | Standard Deviation | Standard Error | 95% Confidence Interval for Mean | | F Value * | P - Value# |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound | Upper Bound | | |
| Survival Time | Maxillary Incisor | 37 | 7.9730 | 2.53297 | 0.41642 | 7.1284 | 8.8175 | 1.51 | 0.17 |
| | Maxillary Canine | 20 | 8.1000 | 2.51103 | 0.56148 | 6.9248 | 9.2752 | | |
| | Maxillary Premolar | 10 | 10.2000 | 0.42164 | 0.13333 | 9.8984 | 10.5016 | | |
| | Maxillary Molar | 5 | 10.0000 | 0.00000 | 0.00000 | 10.0000 | 10.0000 | | |
| | Mandibular Incisor | 96 | 8.6250 | 2.57621 | 0.26293 | 8.1030 | 9.1470 | | |
| | Mandibular Canine | 47 | 8.4043 | 2.63471 | 0.38431 | 7.6307 | 9.1778 | | |
| | Mandibular Premolar | 12 | 7.8333 | 2.51661 | 0.72648 | 6.2344 | 9.4323 | | |
| | Mandibular Molar | 5 | 9.4000 | 1.51658 | 0.67823 | 7.5169 | 11.2831 | | |
| | Total | 232 | 8.5043 | 2.50194 | 0.16426 | 8.1807 | 8.8280 | | |
| Probing Pocket Depth | Maxillary Incisor | 37 | 5.5676 | 1.80340 | 0.29648 | 4.9663 | 6.1689 | 3.13 | 0.00 |
| | Maxillary Canine | 20 | 5.4000 | 1.66702 | 0.37276 | 4.6198 | 6.1802 | | |
| | Maxillary Premolar | 10 | 5.3000 | 1.88856 | 0.59722 | 3.9490 | 6.6510 | | |
| | Maxillary Molar | 5 | 6.0000 | 1.00000 | 0.44721 | 4.7583 | 7.2417 | | |
| | Mandibular Incisor | 96 | 3.9271 | 1.47430 | 0.15047 | 3.6284 | 4.2258 | | |
| | Mandibular Canine | 47 | 3.8511 | 1.25072 | 0.18244 | 3.4838 | 4.2183 | | |
| | Mandibular Premolar | 12 | 5.0000 | 2.08893 | 0.60302 | 3.6728 | 6.3272 | | |
| | Mandibular Molar | 5 | 6.6000 | 0.54772 | 0.24495 | 5.9199 | 7.2801 | | |
| | Total | 232 | 4.5172 | 1.72319 | 0.11313 | 4.2943 | 4.7401 | | |

ANOVA test done under the setting of p value < 0.05; # - P- value obtained in the test.

**DISCUSSION**

Periodontal tooth splinting could be an appropriate method for regaining and maintaining proper functions of the tooth in situations where periodontal tissue support is reduced which is accompanied by chewing discomfort with masticatory dysfunction. [4] Splints limit the forces experienced by a single tooth during occlusal loading by distributing the occlusal force over a large number of teeth. However, it is very important to assess whether tooth splinting would increase the survival time for the tooth and make it function proper. [5] This retrospective study tried to find if the periodontally compromised tooth splinting could further increase the prognosis of the tooth during periodontal therapy and if it could, then the splinting might add value for the evidence based decision making for the clinicians and patients to reduce the mobility and increase patients' comfort and masticatory function.

The higher survival rate found in the present study revealed that splinting of the periodontally compromised teeth during the periodontal therapy is an appropriate technique for maintaining the teeth and to avoid tooth extraction. The loss of the splinted tooth was only one in the present study which adds to the therapeutic option for preventing tooth extraction in the periodontally compromised teeth. The present study findings concorded with the other similar survival analysis study where the loss of the splinted tooth occurred due to the endodontic complications contrary to the present study where it failed because of lost periodontal support.[6]

The stability of the splints over time analysed with Kaplan-Meier estimator found in that study was 74.4% after 3 years from baseline compared to our study survival rate was 86.2% after 6 months, 75.86% after 8 months and 45.69% after 10 months (Figure 4) could be attributed to less data availability in the Institute digital data archive (DIAS). Longer follow-up data was unavailable in the present study which is the main drawback of the study. Compared to the Tokajuk et al. study, they included 56 patients with grade 2 and 3 mobility teeth splinted with fibre-core composite were observed for 10 months.[7] The survival rate of the splinted teeth measured and splint fractures in the present study was not followed in their study where they only measured the clinical measurements such as gingival indices, bleeding indices and PPD.

Splint repairs were needed throughout the follow-up period and the frequency of the repairs were not significant in the present study compared to the other study. [8] There was also concern that the splint would complicate SRP by blocking access to the proximal subgingival basal region. [9] There are some previous studies which found the risk of plaque accumulation in splinted teeth considerably low and the comfort of splinted teeth was not hampered in comparison with the non-splinted teeth. [10] Antagonistic tooth contact, which determines the distribution of masticatory forces, has already been shown to be associated with tooth retention in prosthodontically treated periodontitis patients.[11] Initial/baseline bone loss was also a reason to significantly contribute to tooth loss during long term splinting. [12]

The mean PPD of the splinted teeth found in the present study 4.5±1.7 mm (Table 3) compared to the other study where it was 3.39±1.4 mm. This signifies the data group taken in this retrospective study signified the periodontal status of the teeth. The clinical attachment loss (CAL) data and post splinting followup for PPD was also not available in the DIAS data for the assessment. The data for the fibre glass core composite splints was also not

available in significant numbers for the comparison of the splint materials in the splinted tooth survival. These parameters could be assessed in the future studies. However, the impact of splinting on patients' oral health related quality of life remains unmeasured and needs to be evaluated in future studies.

The present study has a number of limitations. First, the lack of follow-up data impacted the long term data for survival analysis. The findings from this specific population cannot be generalized. Occlusal trauma, smoking, oral hygiene practices and other covariates were not included for their effect on survival analysis of the teeth. Prospective studies with larger numbers of patients are needed to more accurately identify tooth-related factors that enable dentists to save periodontally compromised teeth through splinting in long term scenario.

## CONCLUSION

Despite the limitations of the present study, the survival rate of the splinted periodontally compromised teeth was 99.6% over the 11-month follow-up period. Since there were no factors statistically impacting the splinted teeth in the study, significant splinted teeth stability was seen. But splints required repairs for stabilizing the teeth. Assessment of splinting the periodontally compromised teeth required detailed prospective analysis of all clinical parameters of periodontal findings. However, this study could provide adequate evidence based information for the clinicians and patients to decide on the treatment decision on splinting the compromised teeth or extracting the teeth.

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**CONFLICT OF INTEREST - Nil**

**SOURCE OF FUNDING - Nil**

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