SURVIVAL RATE OF TEETH WITH GRADE II FURCATION INVOLVEMENT AFTER SURGICAL PERIODONTAL THERAPY - A RETROSPECTIVE COHORT STUDY

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Abstract:
The management of furcation involvement is found to be one of the greatest challenges in periodontal therapy as they respond less favourably to the conventional periodontal therapy, and the molars are lost more often than any other tooth type. This may be due to the complexity and difficulty in treating the furcation involved areas during periodontal therapy. The necessity for better survival rate strives for better standards of treatment. The objective of this study is to find the survival rate of Grade II furcation-involved teeth following periodontal therapy. The data analysis of 86,000 patient data records were done and required data regarding periodontal parameter, demographic details preoperative and findings of tooth survival 6 month after periodontal therapy was extracted and descriptive statistics were performed on the data in IBM SPSS Statistical Analyzer (23.0 version) after the data were tabulated. The survival rate of Grade II furcation involved teeth was found to be 66.35%. The survival of Grade II furcation involved mandibular molars was found to have a better survival rate when compared to maxillary molars and (Chi square value, \( p \) value =0.003(<0.05)). Also the survival of teeth was found to decrease with increase in mobility (Chi square value, \( p \) value =0.000(<0.05)) and with increased bone loss (Chi square value, \( p \) value =0.002(<0.05)). Within the limitations of the study, the survival of Grade II furcation involved teeth was found to be moderate post periodontal treatment.

Keywords: Survival, Periodontal treatment, Grade II, Furcation

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1. Introduction:

Periodontitis which is an advanced form of plaque induced periodontal disease, results in destruction of both soft and hard tissue components of the tooth supporting structures leading to bone loss and furcation involvement in multi-rooted teeth [1]. According to the glossary of terms of the American Academy of Periodontology, a furcation involvement exists when periodontal disease has caused resorption of bone into the bi-furcation or tri-furcation area of a multirooted tooth [2]. Periodontal lesions affecting furcations are very frequently reported in the first maxillary and mandibular molars [3], these being the teeth which, over a patient’s lifetime, have suffered the longest exposure to the action of plaque. The principal objective of periodontal treatment is to preserve the periodontium by eliminating the disease etiology, preventing further attachment loss and making a conducive environment for plaque control and maintenance[4]. The treatment necessary to arrest the development of furcation involves subgingival mechanical debridement and establishment of a local environment for bacteria compatible with gingival health. It includes mechanical removal of supragingival and subgingival plaque and calculus deposits, planing of plaque-retentive anatomical feature (eg. overhangs) and cessation of certain adverse habits (eg. smoking cessation) motivating patients with oral hygiene instructions as well. However, it was shown that microbial endotoxins are not strongly attached on the root surface and that periodontal health can be accomplished without the removal of cementum by scaling and root planing [5]. A wide range of surgical therapy like furcation plasty, tunnelling, hemisections, root resections and regenerative procedures has been advocated to manage these complex anatomic areas. Surgical treatment options have progressed from a less invasive approach, i.e., keeping as much periodontal attachment as possible, to a more invasive approach: open flap debridement with/without gingivectomy or apically repositioned flap and/or tunnelling; root separation; amputation/trisection of a root (with/without root separation or tunnel preparation); amputation/trisection of two roots; and extraction of the entire tooth [6]. Through root-resection therapy, furcation-involved molars can be converted to non-furcated single-root teeth and provide a favorable environment for oral hygiene for patients and clinicians [7]. However, the management of furcation involvement presents one of the greatest challenges in periodontal therapy as furcation-involved molar teeth respond less favorably to conventional periodontal therapy, and molars are lost more often than any other tooth type [8]. This is because of the complex furcation tooth anatomy in the posterior dentition, given the presence root proximities, enamel projections, root concavities, development grooves on root trunks, interradicular ridges, and also the fact that the furcation entrance is smaller than most conventionally used scaling instruments [9]. All these local factors along with age, systemic diseases, and genetic factors could also influence the prognosis and survival of the furcation involved teeth. Even with the availability of so many treatment options, the survival rates of Grade II furcation-involved teeth have not yet been assessed systematically for which the study is carried out. Therefore, the aims of the present study were to determine the survival rate, factors determining the survival of multirouted teeth with furcation involvement following completion of periodontal therapy.
2. Materials And Method:
This study was designed as a retrospective cohort study, conducted in a group of subjects reported to the university dental hospital. After obtaining approval from the institutional ethical committee, the dental records of patients who reported to the dental hospital between June 2019 to March 2020 were assessed for eligibility to be included in the study. A total of 86,000 patient records were screened for eligibility by the principal investigator based on the following inclusion and exclusion criteria.

Inclusion criteria:
- Subjects above 18 years of age
- Subjects who reported between June 2019 to March 2020
- Subjects diagnosed with periodontitis exhibiting at least one tooth with grade II furcation, who underwent any of the following periodontal therapy such flap surgery, root resection, hemisection, furcation plasty, bone grafting, guided tissue regeneration post scaling and root planing,
- Subjects who completed at least a 6 month followup and maintenance visits
- Subjects whose records have complete data regarding the preoperative furcation involvement details, radiograph (OPGs, IOPA) and other periodontal parameter records, details of periodontal therapy performed, clinical examination details during the followup and maintenance visits.

Exclusion criteria:
- Smokers
- Medically compromised patients
- Patients records with incomplete data

A total of 104 records which satisfied the inclusion and exclusion criteria were included in the study. All the procedures were performed by the post graduate students specialising in periodontics. From the pre operative and post operative records of the study population, data such as age, gender, tooth with grade II furcation, mobility (Grade 0, 1, 2 and 3), bone loss levels (mild- 1-2 mm, moderate- 2-4 mm and severe- 4 mm<), post operative findings and observations were obtained. The primary outcome of this study was the survival rate of grade II furcation involved teeth and the secondary outcome was the correlation between age, gender, tooth affected, periodontal therapy and survival of the teeth. The data was analysed by IBM SPSS Statistical Analyzer (23.0 version). Frequency distribution for categorical variables and descriptive analysis for quantitative variables were carried out. The association between the variables were analysed and assessed using Pearson Chi-square test. p value less than or equal to 0.05 was considered to be statistically significant.

3. Results And Discussion:
The results of our study (Figure 1) shows that the nearly two third of the teeth with Grade II furcation survived after periodontal management (66.35%) and about one third (33.65%) of the teeth were lost during the 6 month
maintenance after periodontal therapy. However earlier reports on the survival rate of Grade II furcation involving teeth after periodontal treatment ranging from less than 10% to up to 90% in various studies (Bergenholtz et al, Basten et al., Blomlof et al. Erpenstein et al., Dannewitz et al., etc) after varying periods of observation [10–15]. These variations might be due to differences in the study designs, evaluation period etc. Also the study results show a trend of higher survival of teeth with grade II furcation in females when compared to males after periodontal therapy (Figure 2) which is similar with earlier studies[16]. This may be because of the increased concern about oral hygiene maintenance habits seen with females compared to males. With regard to the amount of bone loss (Figure 3) affecting the teeth with grade II furcation the survival is better in mild and moderate cases when compared to severe cases. This concurs well with a study that showed decrease in bone height to be a confounding factor for loss of furcation involved teeth [16]. When the degree of mobility was assessed as a confounder in survival of grade II furcation involved teeth, the teeth with Grade I mobility showed better survival than Grade II mobile teeth. This is similar to an earlier study where they have reported that mobility played an important role in the survivability of the teeth[17], where the severe mobility decreases the rate of survival of Grade II furcation involved teeth. The study population had subjects with age having a wide range from 18 to 60 yrs. When age was correlated with the survival of teeth with grade II furcation (Figure 5), we observed the younger age group had better survival than the older aged subjects, however it did not reach statistical significance. Similar patterns of observation were reported in Lee et al[16] study where they concluded that age did not play a role in the survival of teeth with grade II furcation involvement. However contradicting this, a study conducted by?? have reported that the furcation depth increases with age and thereby, the risk of losing the affected tooth increases [18]. The furcation anatomy of posterior teeth differs between maxillary and mandibular teeth considerably due the more number of roots in maxillary teeth adding to the complexity. When assessed whether this has an influence on the survival of teeth with grade II furcation, we observed that more mandibular molar teeth (#47) survived than the maxillary molar teeth (#16 & #17). This is in agreement with previous reports where maxillary molars were mostly extracted [8,19,20]. Among the treatment modalities performed in teeth with grade II furcation involvement our results show that higher survival rate is observed with regenerative periodontal therapy (flap surgery with bone graft/ GTR) compared to conventional flap approach. These results are supported by previous observations, where GTR was found to be effective [21–23]. However it should be remembered that the choice of therapy again is dictated by the severity of furcation lesion and the pattern of bone destruction. Apart from all these oral hygiene maintenance during follow up, genetic factors, environmental factors may also have played a role in survival of the teeth with furcation involvement [24–29], which were not assessed in our study [30–36]. Also, inconsistencies between our results with previous reports may be due to differences in the severity of furcation involvement at baseline[28,37–40], duration of recall intervals, levels of plaque control and presence of risk factors such as smoking[41–45] and genetic susceptibility.[46–50] The limitations of this study include small study population, shorter follow up and retrospective study design. Therefore, future studies with prospective study design, larger sample size and longer follow up are needed to confirm the findings of the study.
FIGURE 1 - This bar graph represents the percentage of survival of teeth with Grade II furcation involvement after periodontal management. X-axis represents the survival rate and Y-axis represents the total percentage of teeth. Almost two-third of the teeth with Grade II furcation survived (green bar) after periodontal management i.e; 66.35% and one-third 33.65% of the teeth were lost (blue bar) after periodontal therapy. Thus, a moderate survival rate is seen among Grade II furcation involved teeth post periodontal therapy.
FIGURE 2-This bar graph represents the association between gender and survival rate after periodontal management of Grade II furcation involved teeth. X-axis represents the gender distribution and Y-axis represents the percentage of teeth. Chi-square test was done and association was found to be statistically not significant. Pearson’s Chi-square value: p value: 0.530(>0.05). Hence, not statistically significant, proving gender does not influence survival.
FIGURE 3-This bar graph represents the association between the amount of bone loss and survival after periodontal management of Grade II furcation involved teeth. X-axis represents the amount of bone loss and Y-axis represents the percentage of teeth which underwent periodontal management. Chi-square test was done and association was found to be statistically not significant. Pearson’s Chi square value: p value: 0.002 (<0.05) Hence, statistically significant, proving that severe bone loss decreases the survival of teeth with grade II furcation.
FIGURE 4-This bar graph represents the association between mobility of teeth and survival after periodontal management of Grade II furcation involved teeth. X-axis represents the grade of mobility and Y-axis represents the percentage of teeth which underwent periodontal management. Chi-square test was done and association was found to be statistically significant. Pearson’s Chi-square value: p value; 0.00(<0.05). Hence, statistically significant, grade II furcation involved teeth without and minimal mobility increases the survival rate compared to teeth with severe mobility.
FIGURE 5- This bar graph represents the association between age and survival after periodontal management of Grade II furcation involved teeth. X-axis represents the age distribution and Y-axis represents the percentage of teeth which underwent periodontal management. Chi-square test was done and association was found to be statistically not significant. Pearson’s Chi-square value: p value: 0.087(>0.05). Hence, the younger age group had better survival than the older aged subjects, however it did not reach statistical significance.
FIGURE 6- This bar graph represents the association between individual teeth and survival after periodontal management of Grade II furcation involved teeth. X-axis represents the individual tooth and Y-axis represents the percentage of patients who underwent periodontal management. Chi-square test was done and association was found to be statistically significant. Pearson’s Chi-square value: p value: 0.007(<0.05) Hence statistically significant, proving higher survival rate of teeth observed in mandibular molars when compared to maxillary molars.
FIGURE 7-This bar graph represents the association between treatment modalities and survival after periodontal management of Grade II furcation involved teeth. X-axis represents the individual tooth and Y-axis represents the percentage of patients who underwent periodontal management. Chi-square test was done and association was found to be statistically significant. Pearson’s Chi square value: p value: 0.000(<0.05) Hence statistically significant, proving higher survival rate of teeth noticed in regenerative flap surgery when compared to flap surgery alone.

4. Conclusion

Within the limitations of this study, it can be concluded that surgical periodontal therapy results in moderate survival rate of Grade II furcation involving teeth, better survival rate in mandibular molars and when regenerative periodontal therapy was done after a 6 months follow up.

5. Acknowledgement

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6. Conflict Of Interest

Nil

7. References:

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