

STATISTICAL ANALYSIS OF THE FACTORS WHICH CAN INFLUENCE THE RESULTS OF THERAPY BY ROOT AMPUTATION ON BRIDGE ABUTMENT TEETH

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ABSTRACT

In this study we have monitored the assessment of the prognosis related to the root amputation therapy and the examination of factors which influenced the failures and had an effect upon the viability of this surgical technique. The statistical analysis carried out within this study comprised two groups of patients summarizing a total number of 146 patients; the study was carried out for a period of 8 years, between 2003 and 2011 respectively. The overall number of patients examined was divided in two groups, maxillary and mandibular. The results of the study evidenced that the failure rate due to periodontal diseases for the two groups of patients represented 30.8%. A higher percentage was recorded for Group 1 – Maxillary as compared to Group 2 – Mandibular. The results of the coronary radicular amputation could be impacted by different factors, known as risk factors which affect the evolution of the periodontal disease; a significant role for that purpose is played by those factors related to the inner resection, to the patient, to the respective tooth and its topography.

Key words: root amputation, periradicular lesions, radicular furcation, biological space.

INTRODUCTION

The root amputation therapy represents a treatment option for molars with periodontal disease, endodontic lesions, for molars requiring restorative procedures or even prosthetic replacements. As the resection of one of the roots of a maxillary or mandibular molar is a sensitive and complex technique it is essential to perform a careful selection of the clinical cases which shall benefit from this technique.

MATERIAL AND METHODS

The use of the root amputation for the two groups of patients has been carried out subsequent to a clinical and radiological thorough examination of each subject. Also, the benefits and risks connected to this conservative technique have been explained and the approval of each patient has been consequently obtained.

The software packages EPI2000 distributed by OMS, SPSS, specialized in scientific and statistical calculations and manufactured by SPSS Company have been used for data processing as well as the Data

Analysis module of MICROSOFT EXCEL.

The recording of data regarding patients by means of the EXCEL program generated the initial data basis from where significant aspects of this study have been drawn out.

The Chi-square test has been used in order to interpret the incidence tables; data were estimated as regards the dependency between the two classification factors and solely the results under 5% have been kept as the percentage was appreciated as a sufficient significance threshold.

The result of the test for data included in the incidence tables has been calculated during the Chi-square test for testing the dependency between the two factors; then, the result has been compared with the threshold value which indicates a significant dependency (a 95% threshold) or a highly significant dependency (a 99% threshold) between the two classification factors.

RESULTS

The first group of patients examined comprised a number of 84 patients exhibiting various impairments of maxillary molars which were preserved by using the coronary radicular amputation therapy.

Out of a total number of 84 patients, 70.24% originated from urban areas and 29.76% originated from rural areas. The majority of the patients originating from urban areas is explained by the fact that the use of this surgical procedure supposes a health education well assimilated and represented by a complete oral hygiene.

As regards distribution of various age groups, 8.33% of the cases examined were represented by patients aged between 20 and 29 years, 21.43% of the cases were represented by patients aged between 30 and 39 years, 30.95% of the cases were represented by patients aged between 40 and 49 years, 29.76% of the cases were represented by patients aged between 50 and 59 years and

9.52% of the cases were represented by patients aged between 60 and 69 years.

During the distribution of the group according to the affectation class of the radicular furcation which conducted to the use of radicular resection therapy the following results were obtained: 19% of the clinical cases involved patients having molars without furcation entrances and defects, 11% of the clinical cases involved patients exhibiting 1st class furcation involvements, 47% of the clinical cases were patients exhibiting 2nd class furcation involvements and 23% were patients exhibiting 3rd class furcation involvements.

As regards the analysis of the batch depending on the existence of periapical lesions found in molars which benefited from the root amputation therapy, 64% of the cases examined did not exhibit affectation of the apical periodontium and 36% of the cases revealed periapical lesions and were assisted by means of conservative therapy.

By analysing the group in terms of viability or success of the surgical intervention and of the causes which led to the radicular resection therapy we noticed that the best success rate is represented by clinical cases within which the reason for having carried out the radicular resection was determined by periodontal diseases, namely 45.24% (Fig. 1).

During the distribution of the group according to the reason for the failure and localization of impacted teeth, the highest percentage failure of 25% was due to periodontal infections and was located at the level of Maxillary Second Molar while the failure due to endodontics-related causes at the level of the same tooth recorded the most reduced percentage of 4.17%. At the level of Maxillary First Molar, the failure due to periodontal infections generated a more reduced percentage of 16.67% while compared to the Maxillary Second Molar.

The failure due to periodontal causes located at the level of the disto-vestibular root of maxillary molars represented a majority of 29.17% while the failure due to radicular fractures located at the level of the same root summed up only 4.17% of the cases examined. The failure due to caries located both at the level of mesio-vestibular root and at the level of the disto-vestibular root displayed the same percentage, namely 12.50%.

The second group examined comprised a number of 62 patients exhibiting different lesions of the mandibular molars. 66% of the clinical cases of this batch were patients who came from urban areas and 33% came from rural areas.

The distribution of the group according to the affection class of the radicular furcation which conducted to the use of radicular resection therapy comprised: 18.29% of the clinical cases involved patients having molars without furcation entrances and defects, 7.11% of the clinical cases involved patients exhibiting 1st class furcation involvements, 21.34% of the clinical cases were patients exhibiting 2nd class furcation involvements and 16.26% were patients exhibiting 3rd class furcation involvements.

The distribution of the clinical cases depending on the existence of periapical lesions found at the level of mandibular molars, which were actually the reason for

surgical interventions, has been carried out as follows: an affection of the apical periodontium was found in 24 patients representing 39% of the overall clinical cases while no modification at the level of the apical periodontium was found in 61% of the clinical cases summing up 38 patients.

Upon the analysis of the group depending on the viability or success of the surgical intervention and of the causes which led to the radicular resection therapy the best success rate is represented by clinical cases within which the reason or cause which led to the surgical intervention was represented by periodontal diseases, 30.65%, followed by radicular fractures in descending order representing 16.13%, endodontic causes representing 14.52% and dental caries representing 4.84% (Fig. 2).

During the distribution of the group according to the reason for the failure and localization of impacted teeth, the highest percentage failure of 25% was due to radicular fractures and was located at the level of Mandibular First Molar while the failure due to endodontics-related causes recording the highest percentage, 19.05%, was located at the level of the Mandibular Second Molar. The failure due to dental caries led to the same percentage – 4.76%, both at the level of the Mandibular First Molar and at the level of Mandibular Second Molar.

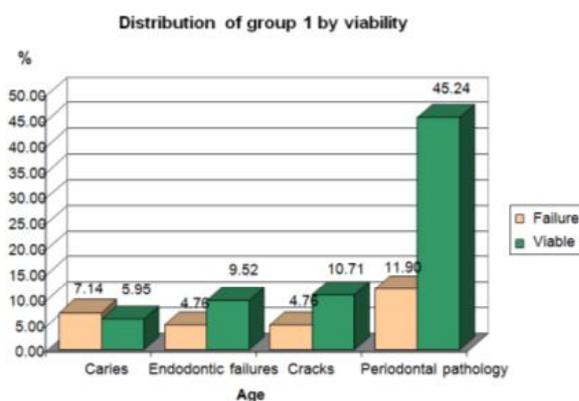


Fig. 1. Distribution of group 1 by viability

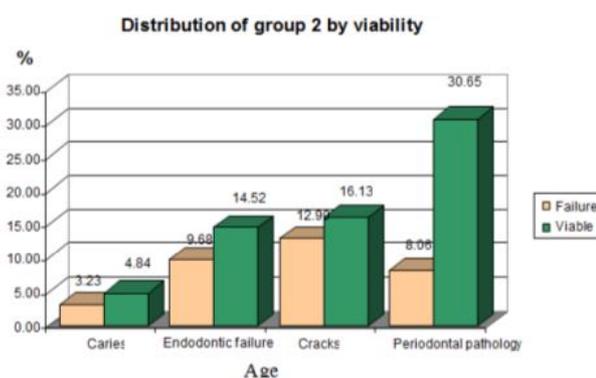


Fig. 2. Distribution of group 2 by viability

By making a comparison of the viability or success rate of the coronary radicular amputation therapy we notice that within Maxillary first group the most successful rate is attributed to periodontal causes which constituted the reason for radicular intervention as compared to Mandibular 2nd group; as regards the Mandibular second group the most viable were the endodontics-related causes and fractures (Fig. 3., Tab. 1).

The result of the Chi-square test does not exceed 7.81, a significance threshold value of 95% for 4x2 incidence tables which indicates the absence of influence between the two factors. Although the two factors are different in terms of numbers and percentage, the insignificant number of cases prevents us from revealing that these differences are

indicative from a statistical point of view.

As regards the comparison between the two groups concerning the failure rate we could state that within the Mandibular second group the cause of failures due to endodontic complications and radicular fractures is higher than within the Maxillary first group (Fig. 4, Tab. 2).

The result of the Chi-square test does not exceed 7.81, a significance threshold value of 95% for 4x2 incidence tables which indicates the absence of influence between the two factors. Although the two factors are different in terms of numbers and percentage, the insignificant number of cases prevents us from revealing that these differences are indicative from a statistical point of view.

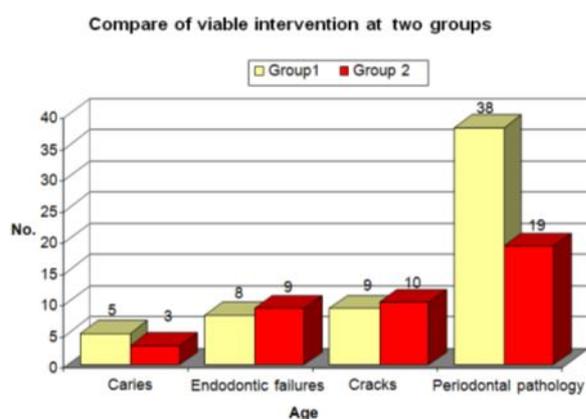


Fig. 3. Compare of viable intervention at two groups

Viable	Caries	Endodontic failures	Cracks	Periodontal pathology
Group 1	8.33	13.33	15.00	63.33
Group 2	7.32	21.95	24.39	46.34

Chi square	3.494186
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Tab. 1. Viability of surgical method at two groups by cause

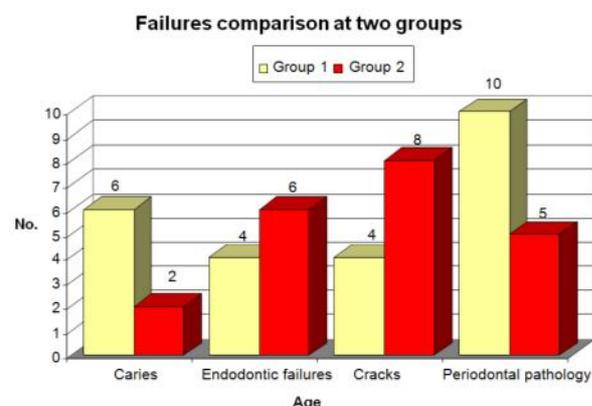


Fig. 4. Failures comparison at two groups

Failure	Caries	Endodontic complications	Cracks	Periodontal complications
Group 1	25.00	16.67	16.67	41.67
Group 2	9.52	28.57	38.10	23.81

Chi square	5.223214
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Tab. 2. Causes of surgical failures

DISCUSSIONS

The root amputation is a procedure which consists in the removal of the affected root of the pluriradicular tooth together with its coronary section; this technique supposes an appropriate interdisciplinary collaboration in order to preserve the impacted molar (1).

In 1981 Langer (2), reported a failure rate of 38% regarding the root amputation therapy within a study carried out during a period of 10 years. The main causes of the failures were: radicular fractures (18%), periradicular infections (10%) and endodontic lesions (7%). Buhler (3) reported a failure rate of 32% regarding the radicular resection therapy within a study carried out during a period of 10 years on a number of 34 molars; 44% of the failures out of this percentage were due to periodontal complications. The main causes of the failures were represented by the endodontic pathology and the radicular fractures. Within the present study, the failure rate due to periodontal causes for the two batches of patients represented 30.8%, recording a higher percentage for the Maxillary first group as compared to the Mandibular second group, which is relative to data found within the specialized literature. The same failure rate was discovered by Blomhlof and collaborators (4) within a study carried out during a period of 10 years where 80% of the failures were due to some periodontal and endodontic complications. Hamp (5) revealed the effect of different treatment modalities related to various infections of the radicular furcation at a number of 310 molars. A number of 85 molars were treated by means of the radicular resection therapy. In 5 years no molar was extracted and the periodontal conditions were appropriate and only two molars had periodontal pockets exceeding 6 mm. This indicated the fact that modifications generated within the supragingival medium and in the under gingival tissue, in the

absence of a very good oral hygiene, could be critical for the periodontal stability.

The same successful periodontal procedure was reported by Epstein (6) who treated a number of 34 molars by means of radicular resection. The study was carried out during a period between 1 and 7 years during which four teeth have been extracted, three of them exhibiting endodontic complications. As regards the present study, while the periodontal-related failures were more numerous in patients included in the Maxillary first group as compared to patients included in the Mandibular second group, namely 10 molars out of 84, for patients ranging within the Mandibular second group the endodontic-related failures, 6 molars and the fractures-related failures, 8 molars out of 64, are more numerous as compared to patients included in the Maxillary first group. This also results from the study carried out by Langer (2) and cited by Shillingburg (7). The main study which was performed in connection with the radicular resection therapy belongs to Carnevale (8) who treated a number of 194 patients out of which 488 molars were resected. All molars' roots were prosthetically restored. The study was carried out during a period between 1 and 11 years; at the end of the study all patients were included in a therapy strict program regarding the dental and periodontal support. The success rate reached 94%, only 28 molars were extracted and the cause of failures included endodontic complications (four teeth), dental caries (nine teeth), fractures of the pillar teeth (three teeth) and radicular fractures (nine teeth). Also, three molars with periodontal pockets exceeding 5 mm were included within the failures' category. The small rate of failures could be explained by the fact that both the selection criteria of the cases that benefited from the radicular resection therapy and the conditions for preserving the results obtained were much

more severe in comparison with other studies. Also, the author of the study and his collaborators applied the radicular resection therapy especially for molars exhibiting a second class affectation of the radicular furcation. The resective therapy has been applied within the present study especially on molars with periodontal affectation and in a similar percentage on molars exhibiting endodontic complications and fractures.

According to the study carried out by Newell (9), there were several failures of the resective therapy encountered in the region of maxillary than in the mandible due to some hidden roots and to some vestibules that could not be noticed during the radiologic examination. Hamp (10) emphasized the difficulties encountered while performing the radicular resection at the level of maxillary molars due to the unfavourable access and the vicinity relation with the other teeth. Mazjoub and Kon (11) reported the fact that the alteration of the biological space occurred in 86% of the distovestibular roots of the resected maxillary molars and only 6% of the resected molars displayed a topography which permitted the appropriate preservation

of the results obtained subsequent to the surgical intervention and prosthetic reconstruction. The failures due to radicular fractures are more numerous within the present study at the level of mandibular molars (8 molars) as compared to the number of fractures recorded at the level of maxillary molars (4 molars) - results in compliance with the study carried out by Langer (2).

CONCLUSIONS

The resective therapy remains a viable treatment option applied to molars exhibiting both periodontal and non-periodontal affectation, the failure rate due to some periodontal complications being larger in comparison with failures resulting subsequent to fractures or endodontic complications.

The residual roots of the mandibular molars are more liable to failures as compared to the roots of the maxillary molars; the explanation resides in the fact that the dental-periodontal resistance coefficient is higher at the level of maxillary molars (two residual roots) as compared to the coefficient at the level of mandibular molars (one residual root).

REFERENCES

1. Preeja C, Presanthila Janam, Haeigin T V et al. -*Kerala Dental Journal*, January 2009; 32, 1: 35-37.
2. Langer B, Stein SD, Wagenberg B -An evaluation of root resections- A 10-year study. *J periodontol* 1981; 52: 719-722.
3. Buhler H -Evaluation of root-resected teeth. Results after 10 years. *J Periodontol* 1988; 59: 805-810.
4. Blomlof L, Jansson L, Appelgren R et al. -Prognosis and mortality of root-resected molars. *Int J Periodontics Restorative Dent* 1997; 17: 190-201.
5. Hamp S-E, Nyman S, Lindhe J Periodontal treatment of multirrooted teeth. Results after 5 years. *J Clin Periodontol* 1975; 2: 126-135.
6. Erpenstein H -3-Year study of hemisectioned molars. *J Clin Periodontol* 1983; 10: 1-10.
7. Shillingburg HT Jr. et al. - Fundamentals of fixed prosthodontics, Third edition, Quintessence Publishing Co, Inc 1997: 212-222.
8. Carnevale G, Pontoriero R, di Febo G - Long-term effects of root-resective therapy in furcation-involved molars. A 10-years longitudinal study. *J Clin Periodontol* 1998; 25:209-214.
9. Newell DH -The role of the prosthodontist in restoring root resected molars: a study of 70 molar root resections. *J Prosthet Dent* 1991; 65 (1): 7-15.
10. Hamp S-E, Nyman S, Lindhe J -Periodontal treatment of multirrooted teeth. Results after 5 years. *J Clin Periodontol* 1975; 2: 126-135.
11. Majzoub Z, Kon S -Toot morphology following root resection procedures in maxillary first molars. *J Periodontol* 1992; 63(4): 290-296.