An Evaluation of Root Resections A Ten-Year Study

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A STUDY WAS UNDERTAKEN to evaluate the long term results of root resections. Records of 100 patients who had undergone root resections 10 years prior to the study were reviewed. Although the immediate postoperative results were gratifying, they were not always lasting. Eighty-four per cent of the failures occurred after 5 years. Most failures were in the mandibular arch and derived from reasons other than inflammatory periodontal disease. Suggestions are made as to how to improve the prognosis of resected teeth.

Root resection therapy has been used in the treatment of advanced periodontal disease for nearly 100 years.¹ During the past 30 years, several authors have reported the successful treatment of many teeth by root resection.²⁻⁷

Hamp, Nyman and Lindhe⁸ reported results 5 years after root resection of multi-rooted teeth. In their study many second molars were eliminated from consideration because of their advanced involvement and eventual difficulty in performing plaque control. Only 16 out of 175 teeth had pocket depths greater than 3 mm at the conclusion of the 5-year postresection period.

Root resections or hemisections have been used rather aggressively by many clinicians to treat all types and gradations of bone loss in furcations. The authors of this report have also used this type of therapy extensively, with diverse long-term results. Therefore, a study was undertaken to evaluate the results of root resections used to eliminate periodontal pockets around teeth with furcation involvements. The study involved review of the records of 100 patients who had undergone root resections at least 10 years prior to the study. To provide a random sample for the study, the first 50 resected mandibular molars and the first 50 resected maxillary molars which fit the time criteria were selected.

Both maxillary and mandibular resected molars were categorized according to the years of tooth survival and the etiology of the breakdown process, i.e., periodontal vs. nonperiodontal. Failure or loss of resected teeth was defined according to the following criteria:

- 1. *Periodontal:* Loss of more than 50% of the remaining alveolar bone present after the first six postoperative months. This was determined radiographically.
- 2. *Endodontic:* The development of unresolvable root fractures or untreatable periapical areas.

3. Caries: The presence of undermining caries, rendering the tooth nonrestorable.

RESULTS

A total of 38 teeth out of 100 failed during the 10 year period of observation. Only 15.8% of these occurred within the first 5 years after surgery. Between the 5th and 7th years, 55.3% of all failures occurred. Only 26.3% of the failures resulted from progressive periodontal breakdown and most of those were maxillary molars (Tables 1 and 2). There was approximately a 2:1 ratio of mandibular to maxillary failures (Table 2). The failure of mandibular molars was most commonly the result of root fractures, followed by recurrent untreatable periapical pathoses and cement washouts under terminal abutment teeth.

DISCUSSION

There is a great deal of controversy about the treatment of teeth with bone loss in the furcation. Although Corn⁹ and others feel that root resections should be performed at the incipient stage of furcation invasion, Ross¹⁰ feels that resection is not necessary for a favorable tooth survival rate. The results of the present study show that although the immediate postoperative results are gratifying, they are not always lasting, even when surgery is properly performed. Very few failures were recorded during the initial 5-year postoperative period. Indeed, in most instances the breakdown process did not become evident until 5 to 10 years had elapsed. It should be emphasized, therefore, that any study on root resections must be evaluated over a period of at least 10 years if the results are to be meaningful (Figs. 1a through d).

Although the primary reason for performing root sections was to treat or eliminate periodontal lesions, most

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failures resulted from endodontic or restorative problems and not periodontal disease. Five of the teeth that failed because of recurrent periodontal breakdown started with minimal supporting bone or deep osseous craters within the furcation, making them poor candidates for this procedure. The remaining five teeth that failed for periodontal reasons were all maxillary molars. Failure of these teeth was related to the recurrence of pocket depth and the development of additional bone loss in the

Table 1

Number of Teeth That Have Failed at Different Time Intervals

YEARS	non- PERIODONTAL	PERIODONTAL	TOTAL
1-4	4	2	6
5-7	20	7	27
8-10	28	10	38

remaining furcations. These problems appeared to occur in tooth areas that were inaccessible to routine methods of plaque control and maintenance therapy (Figs. 2a through d).

The most common cause of tooth failure in this study was root fracture of mandibular molars. Patients who

 Table 2

 Reasons for Failure—Comparison of Maxillary to Mandibular Teeth

REASONS FOR FAILURE	NUMBER OF TEETH FAILED	MAXILLARY FAILURES	MANDIBULAR FAILURES	PERCENTAGE OF MAXILLARY AND MANDIBULAR FAILURES
ROOT FRACTURE	18	3	15	47.4%
PERIODONTAL.	10	7	3	26.3%
ENDODONTIC	7	3	4	18.4%
CEMENT WASHOUTS	3	0	3	7.9%
TOTAL	38	13	25	100%



Figure 1a. Root resection was indicated to eliminate the pockets in the furcation of the mandibular left first and second molars. b. Periodontal surgery resulted in total pocket elimination around both teeth. c. Four years after completion of treatment, a radiograph of the area revealed no evidence of pathosis. d. Seven years after completion of treatment the radiograph revealed an unresolveable periapical lesion on the mesial root of the second molar. Note the healthy appearance of the bone between the roots of the first molar.

had been functioning well for years suddenly developed pockets to the apex along one surface of a root. Exploratory surgery routinely revealed root fractures. In our opinion, parafunctional occlusal habits along with the small size of these roots made these teeth particularly susceptible to fracture. Other related factors included weakening of the lateral walls of the remaining roots during endodontic instrumentation or post preparation and poor post design (Figs. 3a through c). Additional reasons for failure of mandibular teeth included cement washouts, undermining caries and recurrent periapical pathoses.

Is is likely that maxillary molars did not succumb to occlusal forces as readily as mandibular molars for several reasons. First, most maxillary molars have at least two roots remaining after resection, one of which is usually a large palatal root. This root, which helps the tooth to withstand occlusal forces, is definitely less susceptible to root fracture than the smaller roots of mandibular molars. In addition, the remaining tooth structure in a maxillary molar has a large enough surface area to provide retention for an overlying casting. Finally, in the maxilla, the resected molars studied were most often among a group of splinted teeth, and thus were not necessarily the sole abutment for a fixed prosthesis. In the mandibular arch, however, the remaining root often served as an isolated abutment for a bridge replacing at least one tooth. It seems that the longer the edentulous span anterior to the remaining resected root, the greater the chance for root fracture or cement washout.

Six teeth or 15.9% of the teeth failed for endodontic reasons other than root fracture. In many instances, the recurrent periapical pathosis was untreatable either because of the presence of cast posts or abnormal root anatomy.

Considering the factors that were associated with tooth failure, it appears that the prognosis of teeth treated by root resection technic can be improved if certain criteria are followed. Obviously case selection and execution of technic are extremely important in order to decrease the incidence of root fracture and washouts. Only teeth with large roots and large clinical crowns should be utilized. Isolated mandibular teeth should not be routinely utilized for terminal abutments for fixed bridges, nor should tipped teeth.

The endodontist must preserve as much tooth structure as possible by using the smallest access possible and not over-enlarging the canals. The occlusion must be continually checked and adjusted and often patients should be using occlusal appliances to help reduce the forces placed on these teeth during parafunction.

Periodontally, teeth with significant vertical bone loss within the furcation should not be treated with this technique because pocket elimination procedures usu-





Figure 2a. To eliminate the mesial and distal furcation involvements on the maxillary first molar, resection of the palatal root was indicated. b. Note the bone completely filling the furcation between the two remaining roots. c. A radiograph of the area taken 6 years after completion of treatment revealed progressive bone loss in the remaining furcation.







ally compromise the support of these teeth to the point that they offer little support to a splint and are very difficult to maintain. Pockets must be totally eliminated at the time of surgery. No residual craters should be left to fill as part of an extraction socket. The root should be removed in an atraumatic fashion or some of the interfurcal bone may be lost resulting in a residual crater in a critical area. The patient must be continually monitored for efficient plaque control and maintenance therapy.

SUMMARY

Root resections were performed in an attempt to eliminate pocket depth, inflammation, and furcations around molars. A random sample of patients who had been treated with root resections were evaluated after a 10year period. The results demonstrated that although the immediate postoperative results are gratifying when the procedure is properly performed, these results are not always lasting. The dynamics of bone loss which cause the original furcation defect are not always totally eliminated by this procedure. Thus, a treated tooth may continue to lose its attachment apparatus. In addition, the added procedures of endodontics and restorative dentistry may also be destructive. In most instances, the breakdown process does not become evident until 5 to Figure 3a. A radiograph of the mandibular left second molar 5 years after resection of the distal root revealed no pathosis present. The remaining root functioned as a distal abutment for a sleeve coping removable partial denture. Note the mesial angulation of the mesial root. b. Seven years after completion of therapy, a deep pocket developed on the buccal surface of the mesial root. Surgical debridement revealed a pocket extending to the apex of the tooth. c. Note, the vertical fracture extending to the apex. This was the most common cause of failure in mandibular teeth.

10 years after resection. Specific periodontal, endodontic and restorative factors must be taken into consideration whenever a root resection is contemplated or performed.

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