

Frequency of Occurrence of Lateral Lesions in Maxillary Central Incisors

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Summary

From approximately 10,000 preoperative radiographs kept on file, films of 227 endodontically treated maxillary central incisors, and of 55 untreated pulpless teeth, were selected and examined for the condition of the root canal filling and the presence of lateral and periapical lesions. Lateral lesions were found for no teeth that were completely filled or had partially filled but no unfilled portions of the canal, and for only 5 (3.1%) of 164 teeth having unfilled portions. Periapical lesions were recognized in 83.6% of untreated pulpless teeth, in 66.7% of treated teeth with partially filled canals, in 57.1% of those with unfilled canals, and in 21.6% of teeth with completely obturated canals.

Introduction

Root canal systems have not only various configurations of the main root canals, but of lateral branches and apical ramifications as well¹⁻⁴⁾. The latter, in addition to making pulpectomy and infected root canal treatment difficult, are also one of the many factors lowering success rates⁵⁾. Vertical and lateral condensation methods of root canal filling have been reported effective to some degree in treating lateral branches and apical ramifications^{6,7)}. Even when there is no lateral lesion present, for example, lateral branches or apical ramifications may be found unexpectedly on the radiograph, because they have been filled with the filling material^{8,9)}. But these are not always filled, however,¹⁰⁾ a condition which is more likely to be true when the obturation of the main canal is incomplete. Accordingly, to the extent that unfilled lateral canals are a cause of lateral lesions, we may expect the incidence of such lesions to increase when obturation of the main canal is inadequate.

Incomplete obturation is commonly reported as the greatest cause of endodontic failure¹¹⁾, but there have been no reports on the specific effect of inadequate filling on the incidence of lateral lesions. This question has implications that go beyond routine endodontic procedures. When a dowel is implanted in an endodontically treated tooth, a space may develop between the cemented dowel and the residual filling, replicating the condition of an unfilled or underfilled tooth¹²⁾. This study was done to investigate the relation between such conditions of incomplete obturation and the incidence

of lateral lesions. In addition, data on the relation between the condition of filling and the occurrence of periapical lesions were also obtained.

Materials and methods

Radiographs showing endodontically treated maxillary central incisors, or untreated pulpless teeth of the same type, were selected from the approximately 10,000 preoperative radiographs on file in the Conservative Clinic of Matsumoto Dental College. No information was available, for the 282 teeth whose radiographic images were thus selected, about whether pulpectomy or treatment for an infected root canal had been performed, or what the posttreatment progress may have been. All data was taken exclusively from the radiographs. These were examined by dividing the root into standard thirds (Fig. 1) and observing, for each third, the condition of any root canal filling: whether the canal was completely obturated, incompletely obturated, or unfilled (Fig. 2). The existence of any lateral or periapical lesions visible on the radiograph was then noted.

Results

The teeth selected for this study included 227 teeth showing endodontic treatment, and 55 untreated pulpless teeth. The classification of condition of filling is shown in Fig. 3. All data of the

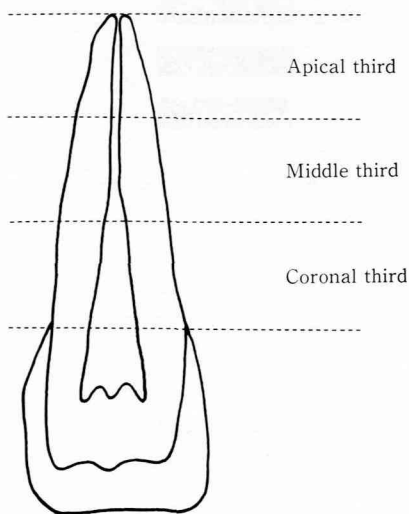


Fig. 1: Division of the root canal



Fig. 2: Classification of condition of the root canal filling

- 1 : unfilled in the apical and middle thirds, and incomplete in the coronal third.
- 1 : unfilled in the apical third, and incomplete in the middle and coronal thirds.

teeth examined, are given to Table 1. The condition of filling for the treated teeth was found to be best in the coronal third, and to deteriorate progressively in the middle and apical portions (Table 2). The distribution of periapical lesions according the condition of filling in the apical third is shown in Table 3. The overall incidence for treated teeth was less than for untreated teeth, and it dropped sharply in teeth whose apical portions were judged completely filled.

The relation between the condition of filling, for the tooth as a whole, and the incidence of lateral lesions is shown in Table 3. No lesions were found in either untreated pulpless teeth, in completely obturated teeth, or in teeth having incompletely filled (but no unfilled) portions. The 5

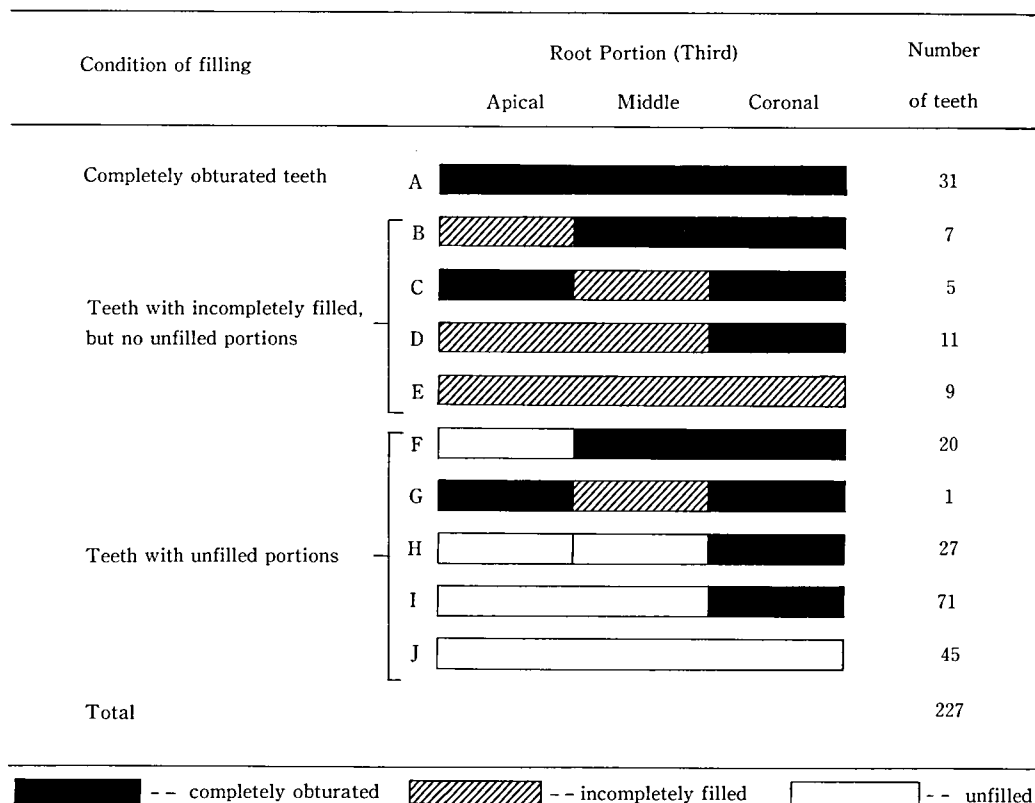


Fig. 3 : Classification of condition of filling

Table 1 : Occurrence of lateral and periapical lesions (All teeth)

Condition of filling	A	B	C	D	E	F	G	H	I	J	K	Total
No lesions	24	3	5	1	5	11	0	12	31	14	9	115
Periapical lesions	7	4	0	10	4	8	1	15	38	29	46	162
Lateral lesions	0	0	0	0	0	1	0	0	1	2	0	4
Both of periapical and lateral lesions	0	0	0	0	0	0	0	0	1	0	0	1
Total	31	7	5	11	9	20	1	27	71	45	55	282

See Fig. 3 as to A~J. K : Untreated pulpless teeth

lateral lesions detected were thus found only in teeth with unfilled portions; two of these were in completely unfilled teeth, two were in teeth with no filling in both the apical and middle thirds, and one in a tooth having only the apical third unfilled. Co-occurrence of both lateral and periapical lesions was observed only once, in one of the teeth in which the apical and middle thirds only were unfilled.

Discussion

The main purpose of this study was to determine whether conditions of incomplete obturation lead to the development of lateral lesions. While the number of such lesions found was small, it was generally observed that they occurred only in teeth with unfilled canals. The mechanism by which these lesions develop is presumed to involve unfilled lateral branches. The authors previously investigated the incidence of lateral branches and apical ramifications in maxillary central incisors using cleared specimens¹³⁾. In that study, it was recognized that these irregular configurations occur more than 60% of the time in this type of tooth. Moreover, lateral branches as thick or thicker than a #40 reamer were found in 2.9% of the teeth. In this study, lateral lesions were found to occur in 3.1% of teeth having unfilled portions. The similarities of these figures suggests that such large lateral branches may be the cause of lateral lesions when teeth are left with unfilled portions of the root canal in endodontic therapy.

Preparation of a dowel hole in an endodontically treated tooth sometimes results in an unfilled or underfilled space between the cemented dowel and the residual filling material. It is therefore suggested that, when making a dowel hole in an endodontically treated tooth, the preparation be done as aseptically as possible, that the prepared hole is treated with a root canal medicament and sealed tightly during the temporary sealing period, and the dowel cemented so that no dead space remains in the prepared hole.

Table 2: Condition of filling for 227 endodontically treated teeth

Condition of filling \ Portion	Apical third	Middle third	Coronal third
No filling	163	117	45
Incomplete filling	27	52	9
Complete filling	37	58	173

Table 3: Distribution of periapical lesions according to condition of filling in the apical third

Condition of filling	Number of teeth	Incidence of periapical lesions	Percent
Untreated teeth (no filling)	55	46	83.6
Treated teeth			
No filling	163	93	57.1
Incomplete filling	27	18	66.7
Complete filling	37	8	21.6

Table 4: Occurrence of lateral lesions according to condition of canal filling

Condition of filling	Number of teeth	Incidence of lesions	Percent
Untreated teeth (no filling)	55	0	0
Treated teeth			
Complete filling	31	0	0
Incomplete filling ^a	32	0	0
No filling ^b	164	5	3.1

^a Teeth having at least some incompletely filled, but no unfilled, portions.

^b Teeth having at least some unfilled portions.

It was also observed in this study that the rate of periapical lesions, highest in untreated pulpless teeth, was lower in treated teeth, and especially in those which were completely obturated throughout the root canal. This confirmed again the importance of correct procedures in endodontic treatment to assure a high healing rate^{14~17}.

Conclusions

This study used radiographs of 282 maxillary central incisors, including 227 of teeth that had formerly received endodontic treatment and 55 of untreated pulpless teeth, selected from about ten thousand radiographs taken preoperatively and kept in the conservative clinic of the Dental Hospital of Matsumoto Dental College. These films were examined for the relationship between the state of the root canal filling and the incidence of lateral and periapical lesions. The results obtained are as follows.

1. No lateral lesions were found in the periodontium of untreated teeth, or of treated teeth that were either completely filled, or that had partially filled but no unfilled portions of the root canal. Of the 164 treated teeth having unfilled portions, 5 teeth (3.1%) had lateral lesions.

2. Periapical lesions were recognized in 83.6% of untreated pulpless teeth. This incidence decreased moderately for treated teeth with partially filled and unfilled canals (66.7% and 57.1% respectively), and sharply for completely obturated teeth (21.6%).

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