

EMBEDDED ROOT FRAGMENTS IN COMPLETELY AND PARTIALLY EDENTULOUS JAWS

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جرت دراسة الصور الشعاعية لمرضى سعوديين وغير سعوديين ممن فقدوا أسنانهم بشكل كامل أو جزئي وذلك للكشف عن وجود أجزاء منظمرة من جذور الأسنان. وقد تضمنت الدراسة ٢٣٧ مريضاً من مرضى الدرد أخذت لهم صور أشعاعية بانورامية، وكذلك ٢٩٣ مريضاً أدرج جزئياً أخذت لهم صور من داخل الفم. وأظهرت الدراسة وجود جزء أو أكثر من جذور الأسنان في فكوك ٢٧٪ من مرضى الدرد و ١٣٪ من مرضى الدرد جزئياً. ولقد استخدمت علامات تشريحية لمعرفة السن الذي ينتمي إليه الجزء الجذري ثم جرى بعد ذلك تحديد توزيع هذه الأجزاء في الفكين العلوي والسفلي. ثم تم حساب النسبة المئوية لوجود هذه الجذور في كل فك بصورة منفصلة لمرضى الدرد السعوديين وغير سعوديين. وقورنت بعد ذلك نتائج هذه الدراسة مع دراسات أخرى سابقة.

Completely and partially edentulous jaws of Saudi and non-Saudi patients were radiographically examined to detect the presence of embedded root fragments. Orthopantomographs of 237 completely edentulous patients and intra-oral radiographs of 293 partially edentulous patients were included in the study. One or more root fragments were found in the jaws of 27 percent of the completely edentulous patients and 13 percent of the partially edentulous patients. Anatomical landmarks were used for identification of the tooth to which a root fragment belonged and distribution of root fragments in the jaws was determined. Percentages of the root fragments found in each jaw and each quadrant of the mouth were calculated separately for Saudi and non-Saudi edentulous patients. Findings of the present study were compared with those of previous reports.

Introduction

Radiographic examination of the jaws is an essential part of the evaluation of prospective prosthodontic patients. It helps in the detection of various pathosis and abnormalities of the jaws. Radiographs assist the clinician in planning the treatment and in maintaining healthy and sound residual ridges. Retained rootfragments are often situated in the alveolus as a result of carious destruction of the crown, injury or incomplete extraction of teeth. The earliest available survey by Logan,¹ probably first of the type, reported 10 retained roots in 35 edentulous jaws. Review of the literature over a 70-year period indicated the presence of root fragments in 4.4 to 39.7 percent of the jaws of completely and partially edentulous patients.¹⁻²⁴ A digest of these studies is shown in Table 1.

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The present investigation was undertaken to determine the frequency of occurrence of embedded roots in the jaws of completely and partially edentulous patients admitted to the clinics of the King Saud University College of Dentistry in Riyadh, Saudi Arabia.

Materials and Methods

Orthopantomographs made prior to prosthetic treatment of 237 completely edentulous patients were included in this study. Of these, 136 radiographs were of Saudi patients and 101 of non-Saudi patients of various nationalities. All radiographs were examined in a darkened room using magnifying glass and variable intensity view box. Root fragments above the bone level were excluded and only those embedded in the bone were included in the collected data. Vertical ramus, mental foramen, maxillary tuberosity, zygomatic process, and canine fossa were used as anatomical landmarks for recognizing the tooth to which the retained root

belonged. The presence of any pathosis associated with the retained roots was carefully sought. In a second survey, 293 Saudi and non-Saudi partially edentulous patients were examined by using 20 intra oral radiographs for each patient. The collected data of both groups of patients was analyzed to determine various distributions of embedded roots.

Table 1. Reports of patients with retained roots.

Investigator/s	Reporting Year	Category	Number of patients examined	Percent with retained roots
Logan ¹	1921	CE	35	28.6
Eusterman ²	1921	CE+PE	290	30.7
Cook ³	1927	CE	500	29.0
Gardner & Stafne ⁴	1929	CE + PE	2112	22.2
Cheppe ⁵	936	CE	190	30.5
Waggner & Austin ⁶	1941	CE+PE	1380	23.8
Swenson ⁷	1944	CE	331	31.23
Smith ⁸	1946	CE+PE	1000	15.7
Ennis & Berry ⁹	1949	CE+PE	1002	24.4
Edwards ¹⁰	1951	CE+PE	1050	26.1
Storer ¹¹	1957	CE	500	25.2
Crandell & Trueblood ¹²	1960	CE+PE	519	28.5
Dachi & Howell ¹³	1961	CE	611	26.4
Coy & Wing ¹⁴	1966	CE	452	16.8
Swenson & Hudson ¹⁵	1967	CE	400	16.0
Michaeli et al ¹⁶	1968	CE	117	16.8
Mourshed ¹⁷	1969	CE+PE	1000	39.7
Gasser ¹⁸	1970	CE	250	4.4
Ettinger ¹⁹	1971	CE	538	33.0
Keith ²⁰	1973	CE+PE + D	1000	10.1
Perrelet et al ²¹	1977	CE	287	10.8
Spyropoulos et al ²²	1981	CE	368	31
Jones et al ²³	1985	CE	114	12.3
Axelsson ²⁴	1988	CE	250	11.1
Present Study	1990	CE	237	27
		PE	293	13

CE = Completely Edentulous; PE = Partially Edentulous; D = Dentulous

Results

In 237 completely edentulous patients examined, 123 embedded root fragments were detected. The average prevalence of embedded root fragment per patient was 0.52. These root

fragments were detected in 64 (27%) of the completely edentulous patients. Radiolucency indicating pathosis was not seen around any of these embedded roots. A thin radioiucent line indicating the periodontal space around all or part of the root fragment or part of it, was seen in 32 (26%) of the total 123 root fragments found. The presence of root canal was observed in 22 (17.9%) of the embedded roots.

The incidence of embedded roots in Saudi and non-Saudi completely edentulous patients was calculated separately. In Saudi patients, the embedded root fragments, varying from 1 to 3, were found in 42 (30.9%) of the total 136 Saudi patients. The total number of root fragments detected in both arches was 81. Forty-three (53.2%) of these root fragments were found in the maxillary arch and 38 (46.9%) were found in the mandibular arch. Evaluation of location of these root fragments in the four quadrants of the mouth disclosed (59.3%) root fragments on the left side and 40.7% on the right side [Fig. 1]. The number of embedded root fragments per individual tooth in Saudi edentulous patients is shown in Table 2. A comparatively higher prevalence of remaining roots of mandibular third molars, maxillary first molars, and maxillary first premolars was noticed.

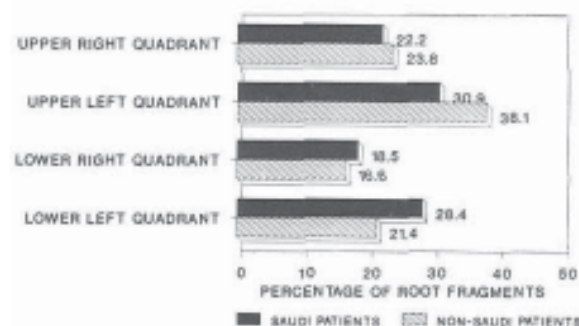


Figure 1. Root fragment distribution per quadrant.

Among the 101 non-Saudi completely edentulous patients, 22 (21.8%) had one or more embedded roots. The total number of root fragments found was 42; 26 (61.9%) in the maxilla and 16 (38.1%) in the mandible. The left quadrants of both the jaws had more embedded roots 23, out of 42 (54.8%) than the right. Figure 1 shows the distribution of root fragments over the four quadrants. The distribution of root fragments per tooth is shown in

Table 3. The distribution of retained root fragments in the molar areas was 27 roots (64.3%) relative to 15 roots (35.7%) in all other tooth areas.

Among the 293 partially edentulous patients, embedded root fragments were detected in 38 (13%) of the patients. A total of 39 root fragments were found. Thirty-six of the root fragments (92%) were in the areas of the maxillary and mandibular molars [Fig. 2]. Of the 39 roots, 23 (59%) were in the maxillary arch and 16 (41 %) were in the mandibular arch.

Table 2. Distribution of the embedded root fragments in Saudi edentulous patients.

Tooth	Maxillary			Mandibular		
	Right	Left	Total	Right	Left	Total
Incisors	1	1	2	0	2	2
Canine	3	3	6	1	3	4
1st Premolar	3	6	9	1	2	3
2nd Premolar	2	3	5	2	2	4
1st Molar	5	6	11	3	5	8
2nd Molar	2	4	6	3	3	6
3rd Molar	2	2	4	5	6	11
Total	18	25	43	15	23	38
Percent	22.2	30.9	53.1	18.5	28.4	46.9

Table 3. Distribution of embedded root fragments in non-Saudi edentulous patients.

Tooth	Maxillary			Mandibular		
	Right	Left	Total	Right	Left	Total
Incisors	0	1	1	0	0	0
Canine	1	2	3	1	0	1
1st Premolar	2	2	4	1	1	2
2nd Premolar	0	2	2	2	0	2
1st Molar	3	5	8	2	3	5
2nd Molar	2	3	5	1	2	3
3rd Molar	2	1	3	0	3	3
Total	10	16	26	7	9	16
Percent	23.8	38.1	61.9	16.7	21.4	38.1

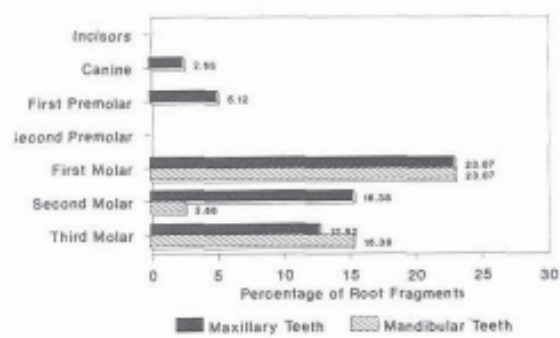


Figure 2. Retained root fragments in the partially edentulous jaws

Discussion

Since Logan's¹ first report of retained roots in the edentulous jaws, several investigators have radiographically examined jaws of fully and partially edentulous patients for detection of retained root fragments. Studies which included both completely and partially edentulous patients have reported the prevalence of retained roots in 10 to 40 percent of the patients.^{2,4,6,8-10,12,17,20} Among these reports, Keith²⁰ reported root fragments in 10.1 percent of the patients, all of whom he examined in his clinic, including the dentulous patients. Except for that of Smith,⁸ who reported retained roots in 15.7 percent of the patients, the rest of the surveys indicated that one or more root fragments were present in 22 to 40 percent of the mixed populations of partially and completely edentulous patients. Retained roots were reported in 4 to 33 percent of the edentulous patients. Gasser¹⁸ reported the lowest prevalence of 4.4 percent of edentulous patients with retained roots. In that study, intra-oral source panoramic radiographs were used; inherent lack of details on these radiographs may account for the smaller number of retained roots detected. Other reports of retained roots in 10 to 20 percent of the edentulous patients are relatively recent.^{21,23,24} Such low prevalence may be due to advances in radiography and exodontia.

The rest of the surveys reported retained roots in 16 to 33 percent of the completely edentulous patients. The number of edentulous patients with retained roots found in our study fall well within the prevalence range reported in previous studies.^{2,21} More of the Saudi edentulous patients had embedded retained roots than the non-Saudis although the ratio of non-Saudi to Saudi edentulous patients with embedded roots was 2:3. Modern dental practices introduced in the Kingdom of Saudi Arabia are likely to cause future decreases in the number of edentulous patients with embedded roots.

Swenson⁷ reported retained root fragments in 31.2 percent of the edentulous patients in a 1941 study. After 20 years, a similar study¹⁵ revealed retained roots in only 16 percent of the edentulous patients. Increased skill of dentists, more number of oral surgeons available and increased use of radiology to assist in extraction are the likely reasons for fewer root fragments found in the latter survey.

Several studies reported a majority of retained roots (60 to 75%) in the edentulous maxillae.^{6-9, 13, 15, 17, 22, 24} No single reference was found showing more roots in the mandible. Thin, slender, and more numerous roots of maxillary teeth are the reason for more root fragments in the maxillary arch.⁷ In this study, in non-Saudi edentulous patients, 62 percent root fragments were found in the maxillary arch. In Saudi edentulous patients, the maxillary arch showed 53 percent of the roots. The reason may be the larger number of mandibular third molar root fragments in Saudi patients.

Several studies^{7,15,19} reported more roots in the right side of the jaws than on the left. In this study, more root fragments were found in the left side for both Saudi and non-Saudi edentulous patients. Obscure vision, difficult access and unfavorable leverage are the difficulties faced in extracting teeth of the left side which may account for more root fragments being abandoned in the left side of the jaws.

Eusterman² reported 10.1 percent roots with residual infection, Mourshed¹⁷ found bony disease in 5.9 percent retained roots. Swenson⁷ stated that 9.6 percent of the roots had an associated radiolucency with bone, whereas Smith⁸ indicated that the number was around 5.9 percent roots. This study revealed no inflammation around any of the embedded roots.

Summary

Orthopantomographs examination of 237 fully edentulous patients revealed the following information.

1. Twenty-seven percent of completely edentulous patients examined showed the presence of one or more embedded roots; and the average distribution of the root fragments per patient was 0.52.
2. Twenty-six percent of the root fragments showed periodontal space and 17.9 percent showed root canals.
3. Root fragments were detected in 30.9 percent of the Saudi completely edentulous patients and 21.7 percent of the non-Saudi completely edentulous patients.
4. In completely edentulous Saudi patients, 53.1 percent root fragments were found in the maxillary arch and 46.9 percent root fragments were

found in the mandibular arch. In non-Saudi patients, those in the maxillary arch were 61.9 percent, and that in the mandibular arch were 38.1 percent.

5. Root fragments in the left side of the jaws were more than those in the right side.
6. Comparatively, large number of mandibular third molar root fragments, (13.6% of the total roots and 28.9% of the mandibular embedded roots) were found in Saudi edentulous patients.

In addition, a survey of 293 partially edentulous patients yielded the following conclusions:

1. Embedded roots were found in 13 percent of the patients examined.
2. High occurrence of root fragments (92.3%) was noticed in the molar region.
3. More embedded roots were observed in the maxillary arch (59%) than in the mandibular arch (41%).

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