

# Electron Probe

## Microanalysis

I.

가 .

40 - 50 $\mu$ m

S

가 .

40 - 50 $\mu$ m  
1.6.9).

F

1)

가 가

Ca, P,

가

가

2 - 5).

Hodge Mckay 13 - 14)

가

Deakins

6)

Manly 15 - 16)

7).

Selvig Selvig<sup>8)</sup> 가 가

Ca<sup>+</sup> Mg, P

가

Selvig Zander<sup>9)</sup> , 가

Ca<sup>+</sup>Mg, P

가

Neider<sup>18)</sup>

Ca, P

4

Aleo 10 - 12)

가 30% Mg

1/2

Selvig Hals<sup>1)</sup>

E. Coli

Mg Ca, P, F 가 가  
 19) 가 가 Barton 12 70%, 90%, 95%, 12  
 100%, 100%, 100% 24  
 2:1, 1:1, 1:2  
 Ca, P, Na 가 Mg 12 100% spurr  
 70 8 - 12 curring

가 (2)  
 Low speed diamond saw 1.0 -  
 3 1.5mm carbon tape  
 aluminum stub ring  
 600 1000 , 1200  
 가 3 9 $\mu$ m, 3 $\mu$ m, 1 $\mu$ m  
 5 0.05 $\mu$ m aluminum  
 powder  
 9

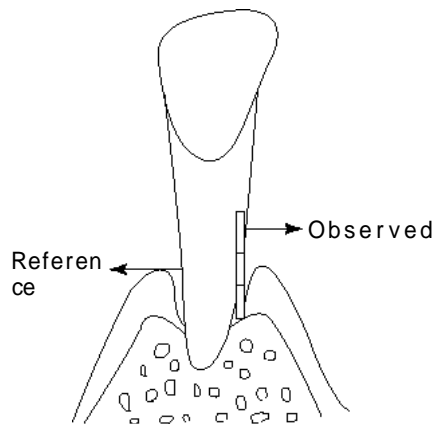
II.

1.

(3) EPMA setting

JXA - 8900R Ca, P, Mg, Na  
 WDS (Wavelength dispersive x - ray

1/4 round bur  
 가 6mm  
 가 2 - 4mm  
 1  
 2  
 30  
 2 - 3



2.

Figure 1. Three analytical area were measured using wavelength dispersive x - ray spectrometer at teeth with probing

(1) Spurr

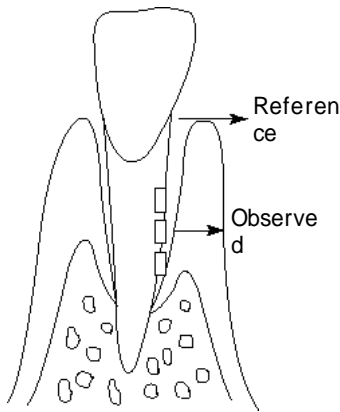


Figure 2. Three analytical area were measured using WDS at teeth with probing depth of 2 - 4mm & gingival recession.

spectrometer)

CEJ

가

2x2mm 3

(Figure 1, Figure 2).

accelerating voltage 20KV, pixel size 5 μm, probe current 2A, probe diameter 2 μm, Dwell time 30.0 m sec 120

(4)

gold - palladium

coating JSM - 840A (JEOL, Japan.)  
3 70

III.

1. Electron Probe Microanalysis

Ca, P

가

가

P

Mg,

Na

가

6mm

Ca, P

가

가

, Mg, Na

2 - 4mm

Ca, P

가

Ca

P

Mg, Na

가

Ca

가

P

Mg, Na

Table 1. Mineral content of normal root & periodontal disease root

		Normal tooth			Tooth with probing depth exceeding 6mm						Tooth with probing depth of 2 - 4mm & gingival recession					
		Premolar			Incisor			Premolar			Incisor			Premolar		
		cervical	middle	apical	cervical	middle	apical	cervical	middle	apical	cervical	middle	apical	cervical	middle	apical
Ca	WDS	164	112	111	160	179	152	181	160	131	188	150	136	127	94	162
P	WDS	54	38	46	50	63	55	61	56	49	62	50	54	64	50	61
Mg	WDS	4	2	2	4	4	4	4	4	3	4	3	2	4	3	4
Na	WDS	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Ca/P ration		3.04	2.95	2.41	3.20	2.84	2.76	2.96	2.85	2.67	3.03	3.00	2.52	1.98	1.88	2.66

가  
(Table 1).

가 28 - 31).

Ca, P

Mg

2

embedding medium

Na

embedding medi -

Ca

um

가

4mm

가

2 -

P

<sup>32 - 36</sup>), Hohling<sup>37)</sup>

가

P가

가

가

가

2.

가

JXA - 8900R

가

가

6mm

water boil

가

가

2 - 4mm

가

<sup>31)</sup>

가

가

가

IV.

Electron beam  
excitation potential

<sup>28)</sup>

가

가

가

가

가

가

가

<sup>21)</sup>,

<sup>22)</sup>,

<sup>23 - 27)</sup>

Ca, P,

μ

Mg, Na

Ca, P

가

Mg

가

가

Neiders<sup>18)</sup>  
Mg

38 - 39), 가

Ca, P 가 Ca, P

1,9,20), 가

Mg, Na 가

Selvig Hals<sup>1)</sup> 가

Mg , preنتين 40) 가

가

가

V.

40 - 50 $\mu$ m

1,6,9) Ca, P Electron Probe Microanalysis

가

2 - 4mm Ca 가 Ca, P

가 Ca, P

1. Ca, P

2. Ca, P

3. Mg 2 Mg, Na

가

Ca, P 8,9) 가

4. Ca, P 가

가

## VI.

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(1)

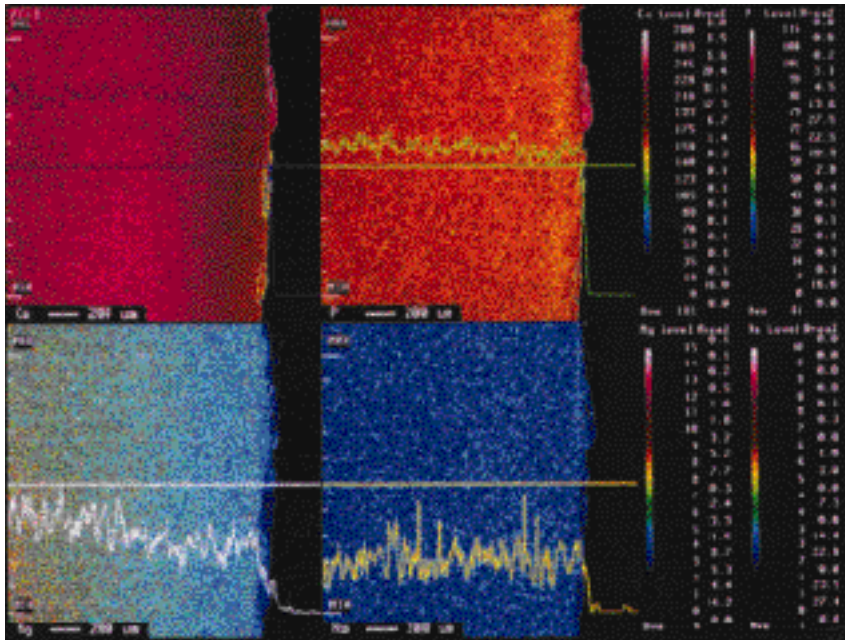


Figure 3. Concentration profile pattern of Ca, P, Mg, Na

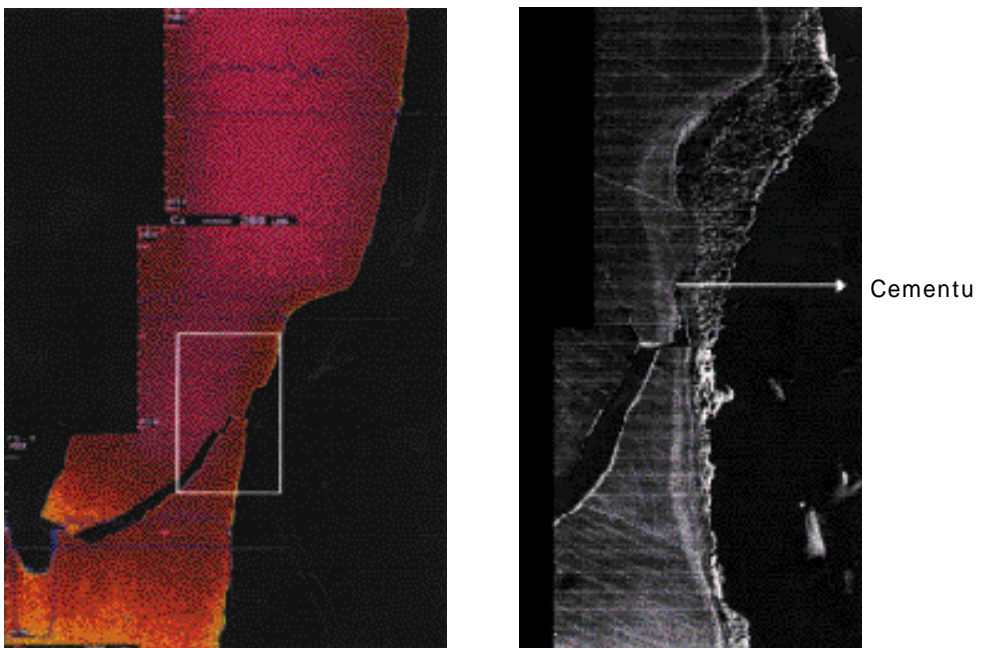


Figure 4. Level of Ca was measured using WED at three areas of normal root & SEM of the same area

( II )

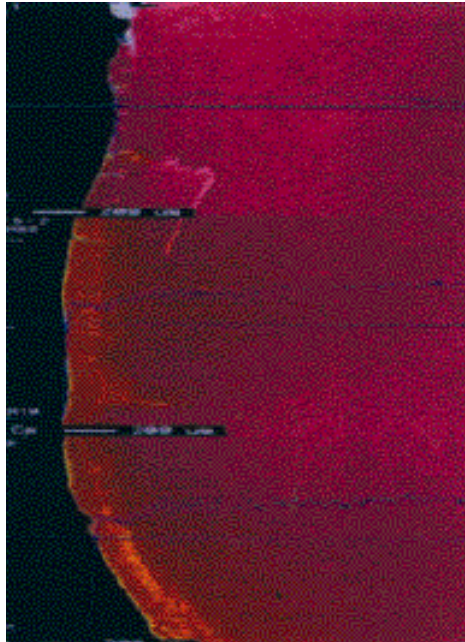


Figure 5. Level of Ca was measured using WED at three areas of periodontal diseased anterior tooth with probing depth exceeding 6mm

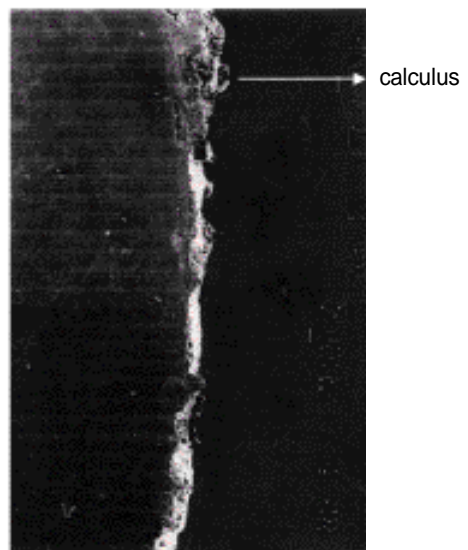
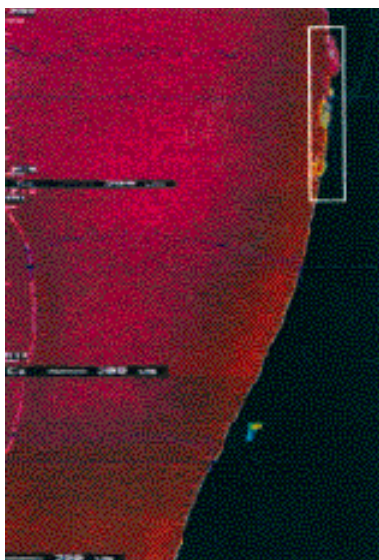


Figure 6. Level of Ca was measured using WDS at three areas of periodontal diseased premolar tooth with probing depth exceeding 6mm & SEM of the same area.

( III )

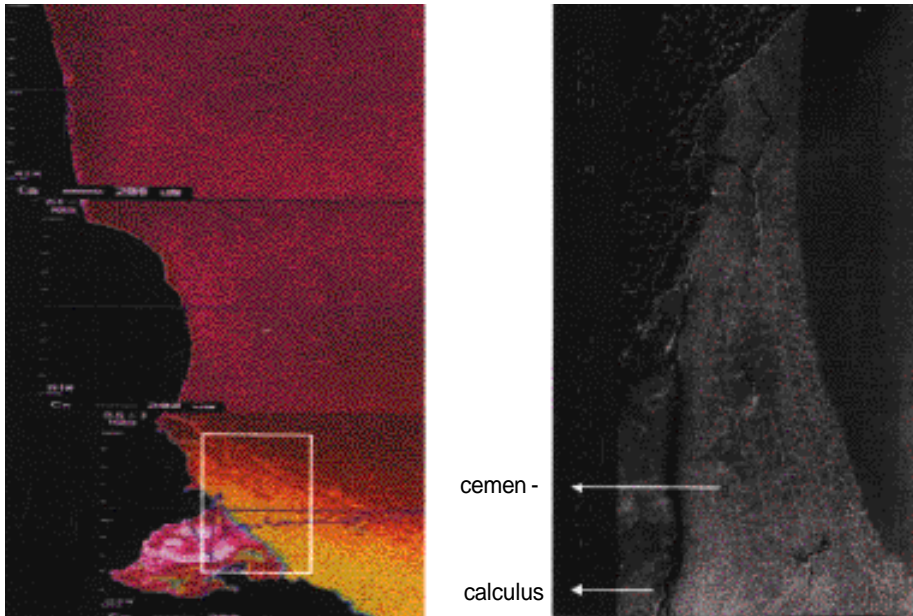


Figure 7. Level of Ca was measured using WDS at three areas of periodontal diseased anterior tooth with gingival recession & probing depth 2 - 4mm & SEM of the same area.

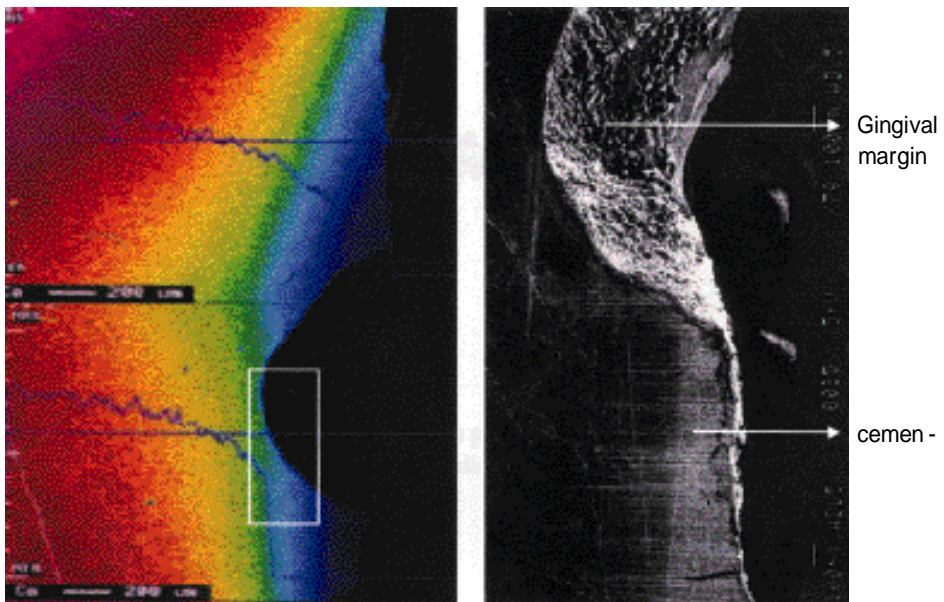


Figure 8. Level of Ca was measured using WDS at two areas of periodontal diseased premolar tooth with gingival recession & probing 2 - 4mm and SEM of the same area.

( IV )

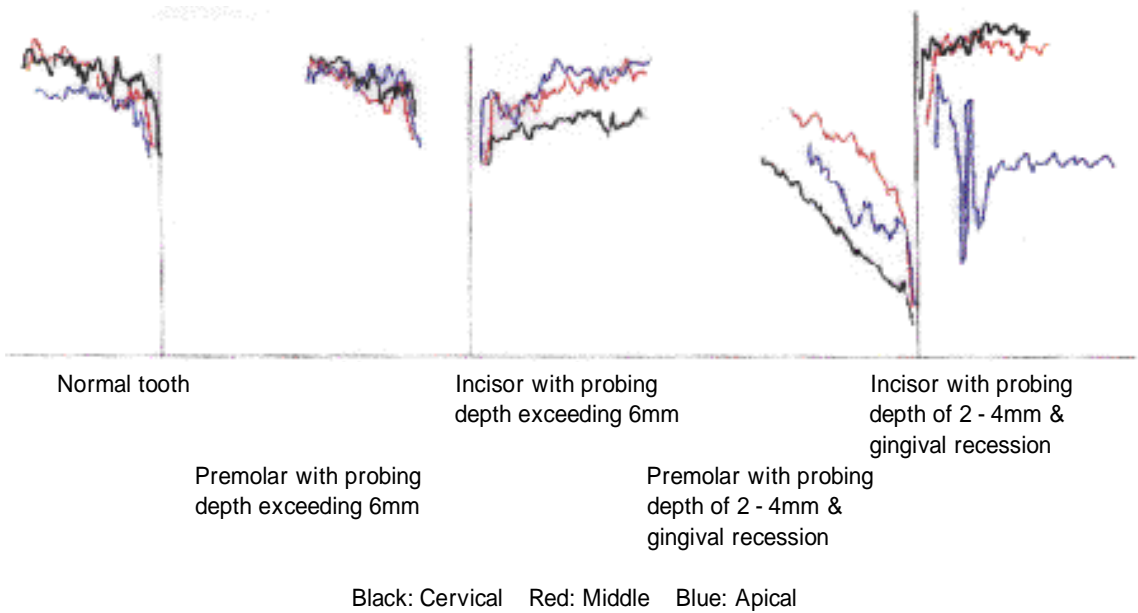


Figure 9. Comparison of Ca in surface cementum

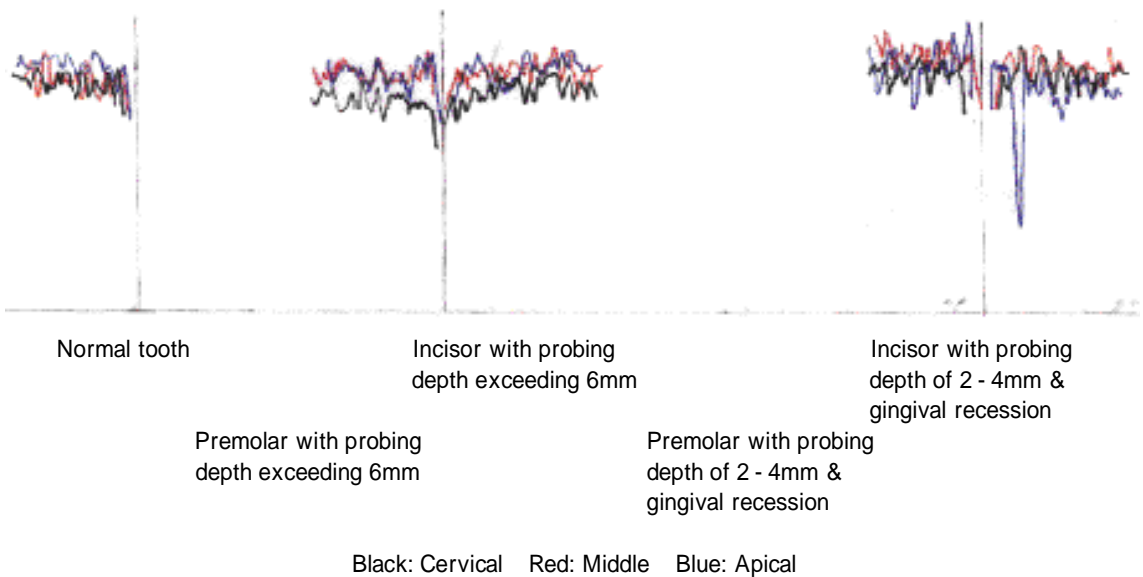


Figure 10. Comparison of P in surface cementum

Figure 3. 가 Mg Ca, P<sub>2</sub> Na

Figure 4. Ca SEM 가 Ca

Figure 5. 6mm Ca 가

Figure 6. 6mm Ca SEM 가

Figure 7. Ca 가 2 - 4mm Ca SEM 가

Figure 8. 2 - 4mm Ca SEM Ca

Figure 9. 가 500 $\mu$ m Ca Ca

Figure 10. 2 - 4mm 가 500 $\mu$ m P P 가



- Abstract -

## Periodontally Diseased Root and Normal Root as Studied by Electron Probe Microanalysis & SEM

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Root surfaces affected by periodontal disease undergo various forms of changes. Cementum exposure from gingival recession may result in absorption of calcium, phosphorus, and fluoride and subsequent hypermineralization and increased radio-density. Although some reports have suggested that inorganic content with root cementum might show various changes depending upon age or extent of periodontal disease, but no consensus can be reached regarding the the distribution of various elements.

The present study examines the difference in mineral content between healthy and periodontal diseased roots by analyzing three areas per tooth along the root surface in cervico - apical direction using electron probe and scanning electron microscope.

Healthy tooth that was extracted for orthodontic purpose was used as control. Experimental teeth include those with periodontal pocket depth exceeding 6mm and those with gingival recession and periodon -

tal pocket depth of 2 - 4mm. Levels of Ca, P, Mg and Na were measured using wave - length dispersive x - ray spectrometer at three areas per tooth. The examined areas were located apical to cemento - enamel junction in control and periodontal ligament - depleted areas in experimental teeth. The corresponding areas were also examined with scanning electron microscope(x70)

The results are as follows.

1. Minerals were detected in order of Ca, P, Mg and Na. In all root surfaces, levels of Ca and P were higher in dentin than in cementum.
2. Level of Mg was twice as high in dentin than in cementum. There was no significant difference in the level of Mg and Na between normal and periodontal diseased roots or between the various locations in the same root.
3. Level of Ca and P in the surface cementum showed no difference between normal and periodontal diseased root, although the areas in dentin with high level of either ion also showed high level of corresponding ion in cementum.
4. Difference in the Ca and P content between various locations within the same root was noted, although no coherent pattern existed.

These results suggest that although the mineral content of the root cementum in periodontitis - affected tooth is affected by exogenous ions from saliva and food, but there was no difference in the mineral con -

tents between normal and periodontally diseased root.