

# Role of Oral and Maxillofacial Radiology in Clinical Dentistry

- Current Status and Future Perspective in Korea -

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The system of Oral and Maxillofacial Radiology education, radiographic equipments and oral health care were evaluated in Korea. The objectives, the length, curriculum guidelines, instructional method and teaching means for undergraduate, and postgraduate education in 9 dental colleges were described. To investigate the radiographic equipments, surveys were received from 6 Dental College Hospitals(DCH), 23 Dental Hospitals(DH) and 373 Dental Clinics(DC). And the results of oral health care were obtained from the surveys of Kyunghee Dental College Hospital(KDCH), 14 Dental Hospitals and 52 Dental Clinics.

## Introduction

It is clear that the radiologic process is important not only in the diagnosis and choice of treatment<sup>1,2</sup> but in the evaluation of healing process and previous treatment.

The development of OMFR technique has resulted in improvements in the radiologic process<sup>3,4</sup>. Recently, advancing technologies have contributed to improve in film-based diagnoses. The computer assisted digitized images is likely to have an important role in the near future. And the digitized imaging system will influence the future education in OMFR. Therefore, it is necessary that the current educational program in OMFR must be changed and the advanced program should be appropriately matched for care patients<sup>3</sup>. Students should have various clinical experience during the advanced educational program. And the radiographic equipments should be provided to support advanced OMFR education.

The aim of this article is to improve the ability of oral diagnosis and level of future education in OMFR.

## System of OMFR Education

### A. undergraduate education

The objectives of this level are to train students in making a correct radiological diagnosis and undertaking treatment. In Korea, undergraduate course is 6 year-curriculum, 2 years for preparation course and 4 years for regular course.

Curriculum guidelines for preparation course give a description of liberal arts and science for 4 semesters. The lecture for regular course begins at 1st or 2nd semester of sophomore and the radiological practice begins at 1st or 2nd semester of senior. And the total points needed are 4-6 points

**Table 1.** Undergraduate Curriculum for Lecture and Radiological Practice

Dental College	Lecture		Practice	
	Total points(hrs)	Begin *	Total points(hrs)	Begin *
Kyungpook	5 (5)	2-1	3 ( 6)	3-2
Kyunghee	6 (6)	2-1	5 (13)	3-1
Dankook	5 (5)	2-1	3 ( 9)	3-2
Pusan	4 (4)	2-1	6 (12)	3-2
Seoul	4 (4)	2-2	4 (16)	3-2
Yonsei	4 (4)	1-2	3 (12)	3-2
Chonnam	5 (5)	2-2	3 (12)	3-2
Chonbuk	4 (4)	2-1	3.5 (11)	3-1
Chosun	5 (5)	2-2	4 (12)	3-1

\* year - semester

and 3-6 points, respectively.

Table 1 shows the undergraduate curriculum for lecture and radiological practice.

Curriculum guidelines give a detailed description of radiation physics, radiation biology and protection, intraoral and extraoral radiographic techniques and diagnostic radiology. Recent curriculum guidelines include a endodontic radiology, salivary gland radiology and implant radiology.

In Korea, the most widely used instructional method for undergraduate course is traditional teaching means. And for evaluation of student's levels, summative examinations are used to grade students.

#### **B. Postgraduate education.**

Postgraduate education currently takes professional and academic programs. The objectives of postgraduate education are to train dentist to be competent as OMF radiologist. The length of professional programs is 3 years, whereas that of academic programs is 2 years for the master's degree and 3 years for doctor's degree. The curriculum of professional programs is generally recognized that trainees must obtain high level of clinical skills and broad curriculum in OMFR. In Korea, the minimum requirements for professional program include the intraoral radiographic interpretation over 10,000 cases, extraoral radiographic interpretation over 500 cases and special radiographic interpretation over 100 cases.

In Korea, the certification of professional training program is at the planning stage. The academic curriculum supplements the professional program with teaching and research skills. In Korea, the master's degree programs are available in association with professional education programs. After the completion of academic programs, the master's degree and the doctor's degree are awarded by the ministry of education respectively.

## Radiographic equipments

In Korea, there are 10 Dental College Hospitals, 328 Dental Hospitals (including dental hospitals in conjunction with medical hospitals) and 9432 Dental Clinics in 1995. And there are 8611 intraoral X-ray machines and 1135 panoramic X-ray machines in 1995.

To investigate the radiographic equipments, surveys were received from 6 Dental College Hospitals, 23 Dental Hospitals and 373 Dental Clinics. Table 2 shows the number of intraoral machine, and Table 3 shows the number of panoramic and other extraoral X-ray machines.

**Table 2.** Number of Intraoral X-ray Machine

Institution Number	Dental Clinics (373)	Dental Hospitals (23)	Dental College Hospitals(6)
1	331	18	0
2	16	1	0
3	3	2	0
4	0	1	0
5	0	1	2
6	0	0	2
7	0	0	0
8	0	0	0
9	0	0	2
Total	372	35	40

**Table 3.** Number of Panoramic Other Extraoral X-ray Machines

Institution X-ray Machine	Dental Clinics(375)	Dental Hospitals(23)	Dental College Hospitals(6)	Total
Panoramic unit	6	2	4	12
Panoramic and cephalometric X-ray unit	71	19	11	101
Panagraphic unit	0	0	4	4
Others	15	1	13	29
Total	92	22	32	146

## Oral Health Care

The results were obtained from the surveys of radiological practices at Kyunghee Dental College Hospital, 14 Dental Hospitals and 52 Dental Clinics.

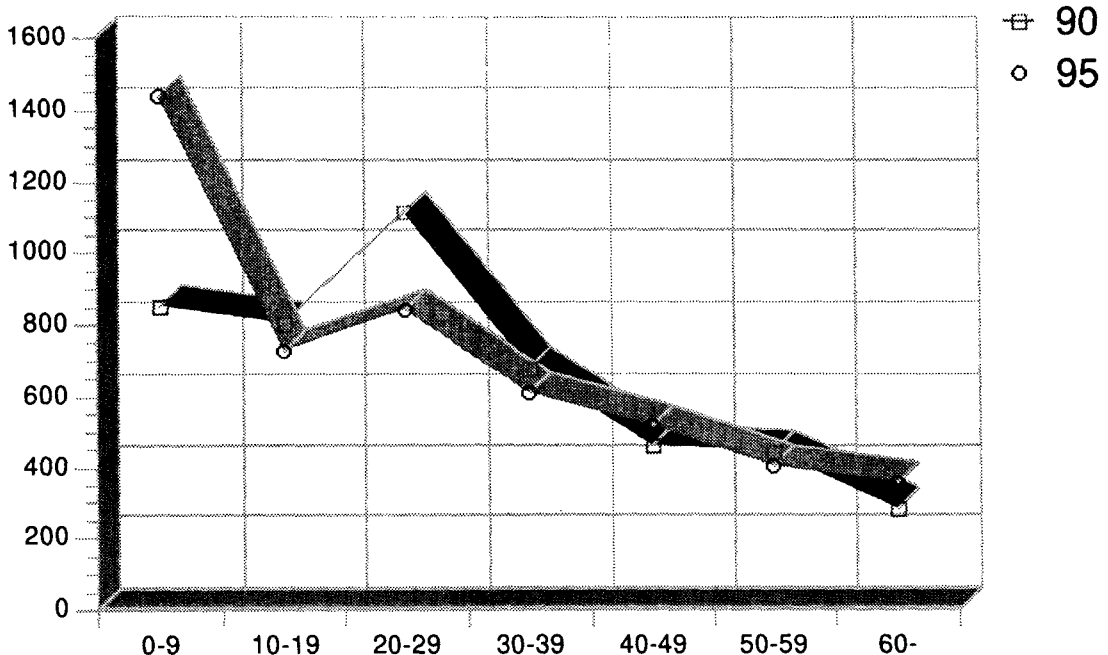
Table 4 and Fig.1 show the intraoral radiographic examination at Kyunghee Dental College Hospital for 4 months(January, April, July and October) in 1990 and 1995. The number of cases was significantly increased at 1st decade in 1995 and the number of films was significantly increased at all decades in 1995.

**Table 4.** Intraoral Radiographic Examination at KDCH (Jan. Apr. Jul. Oct.)

	Age Year	0-9	10-19	20-29	30-39	40-49	50-59	60-	Total
Number of cases(a')	90	849	798	1109	673	455	437	277	4598
	*95	1436	723	836	605	510	399	348	4857
Number of films(b')	90	4004	2569	3491	2818	2305	2253	1127	18567
	*95	5429	3593	3900	3114	3012	2475	1908	23431
Mean number of films(b'/a')	90	4.72	3.22	3.15	4.19	5.07	5.16	4.07	4.04
	95	3.78	4.97	4.67	5.15	5.91	6.20	5.48	4.82

Bivariate frequency analysis, \*P<0.001

KDCH : kyunhee Dental college Hospital



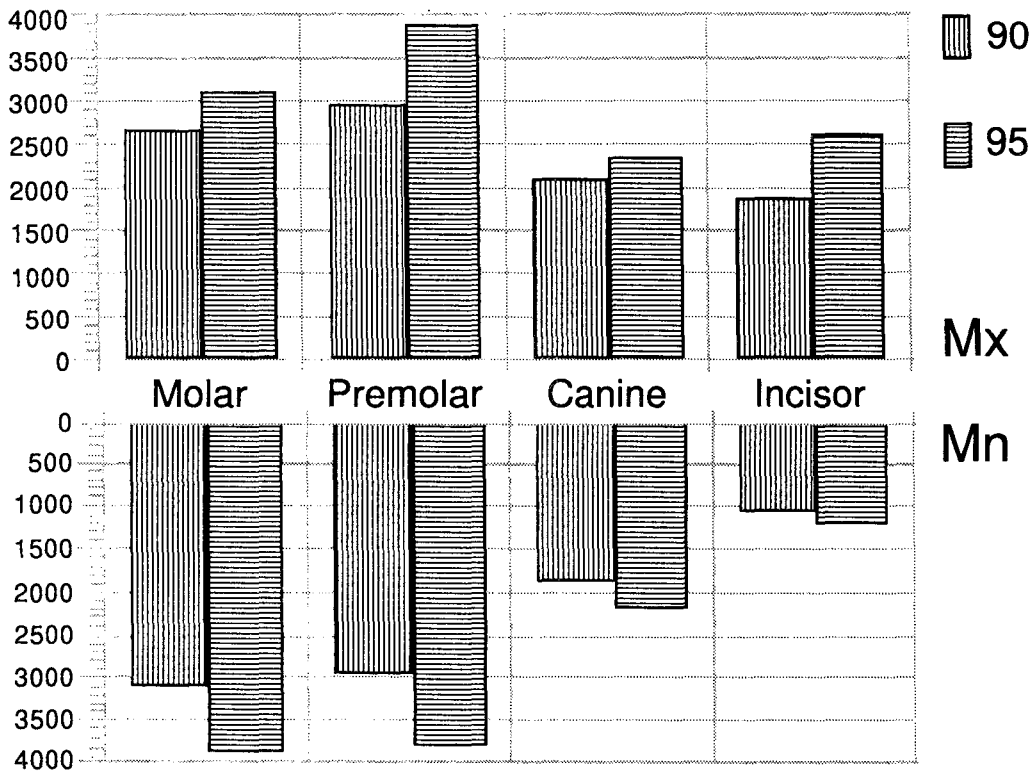
**Fig. 1.** Intraoral Radiographic Examination at Kyunghee Dental College Hospital Total Number of Cases(a') : January, April, July, October

Table 5 and Fig.2 show the frequency of intraoral radiographic examination by site at KDCH. It was significantly increased at both maxilla and mandible in 1995.

**Table 5.** Frequency of Intraoral Radiographic Examination by Site at KDCH(4 months)

Site	Maxilla					Mandible				
	Year	Molar	Premolar	Canine	Incisor	Total	Molar	Premolar	Canine	Incisor
90	2658	2935	2098	1864	9555	3118	2954	1873	1067	9012
95	*3110	3885	2337	2626	11958	**3919	3785	2372	1397	11473

\*P<0.001, \*\*P<0.002



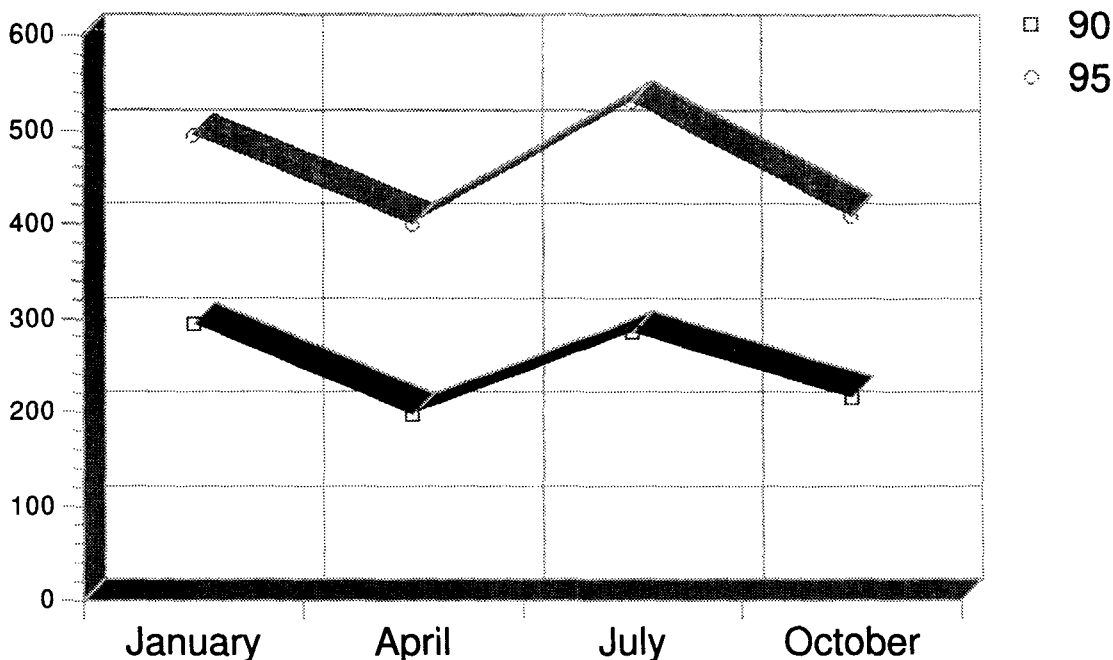
**Fig. 2.** Frequency of Intraoral Radiographic Examination by Site at Kyunghee Dental College Hospital Total (4 months).

Table 6 and Fig.3 show the cases of panoramic radiographic examination at KDCH. Table 6 shows that the total number of panoramic radiographic examination was not significantly increased in 1995. But, the total number of both panoramic and intraoral radiographic examination was significantly increased in 1995.

**Table 6.** Panoramic Radiographic Examination at KDCH(4 months)

	Year	Month				Total
		January	April	July	October	
Panoramic Exam.(A)	90	294	198	285	215	992
	95	494	399	531	409	1833
Panoramic and Intraoral Exam.(B)	90	185	101	158	94	538
	*95	262	215	312	237	1026
B/A	90	0.63	0.51	0.56	0.44	0.54
	95	0.53	0.54	0.59	0.58	0.56
Number of Intraoral Films per Panoramic Film(C)	90	1473	463	1022	533	3491
	**95	2001	1304	1907	1186	6398
C/B	90	7.96	4.58	6.47	5.67	6.49
	95	7.64	6.07	6.11	5.00	6.24

\*P<0.01, \*\*P<0.001



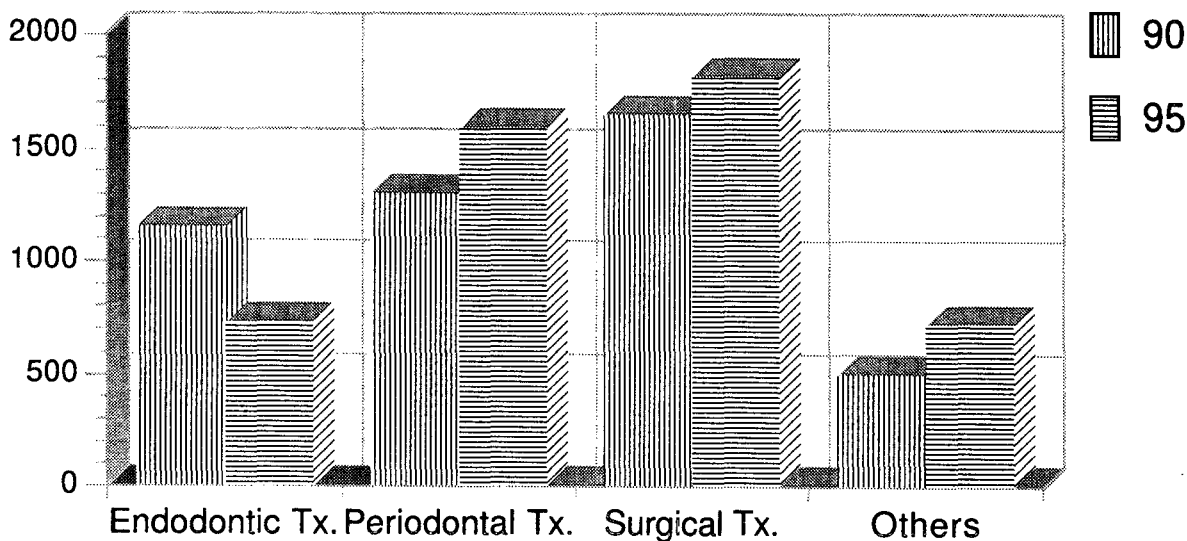
**Fig. 3.** Panoramic Radiographic Examination at Site Kyunghee Dental College Hospital Total Number of Case(A) : 4 months.

Table 7 and Fig.4 show the cases of intraoral radiographic examination classified by objectives at KDCH in 1990 and 1995. It was significantly increased in 1995, especially for the purpose of periodontal and surgical treatment.

**Table 7.** Cases of Intraoral Radiographic Examination at KDCH (by Objectives : 4 months)

Year	Objectives	Endodontic Tx.	Periodontal Tx.	Surgical Tx.	Others	Total
90	Intraoral	1152	1302	1647	497	4598
	Panoramic	130	225	305	332	992
	Other extraoral	7	11	746	327	1091
95	*Intraoral	732	1590	1815	720	4857
	**Panoramic	167	389	818	459	1833
	Other extraoral	11	14	920	466	1411

\* P<0.001, \*\*P<0.02



**Fig. 4.** Case of Intraoral Radiographic Examination at Kyunghee Dental College Hospital (by Objectives : 4 months)

Fig.5 shows the cases of panoramic radiographic examination classified by objectives at KDCH. It was significantly increased, especially for the purpose of surgical treatment.

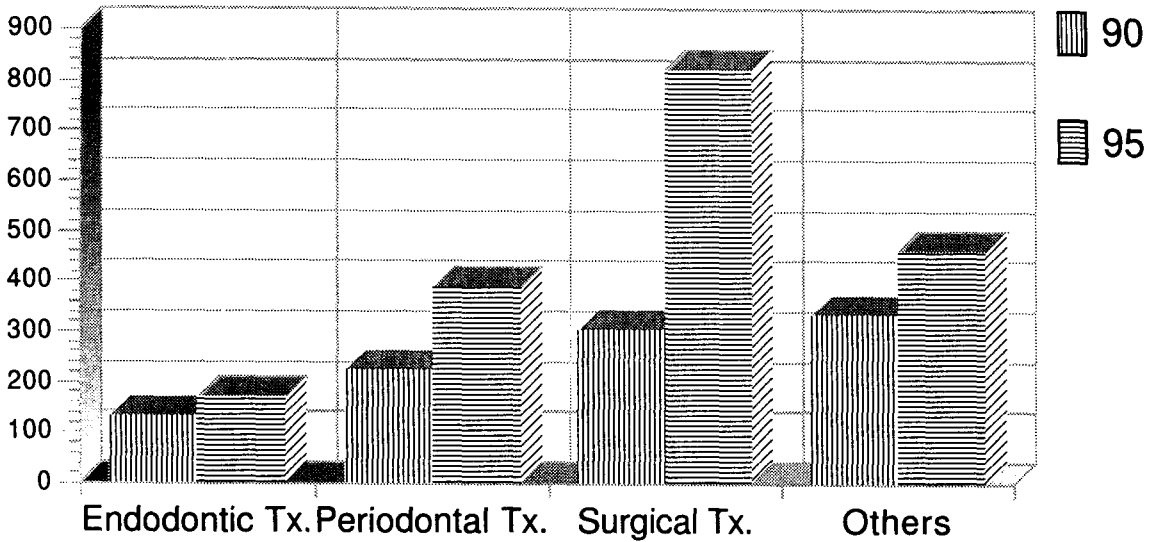


Fig. 5. Case of Panoramic Radiographic Examination at Kyunghee Dental College Hospital (by Objectives : 4 months).

Fig.6 shows the cases of other extraoral radiographic examination at KDCH. It was significantly increased for the purpose of surgical treatment.

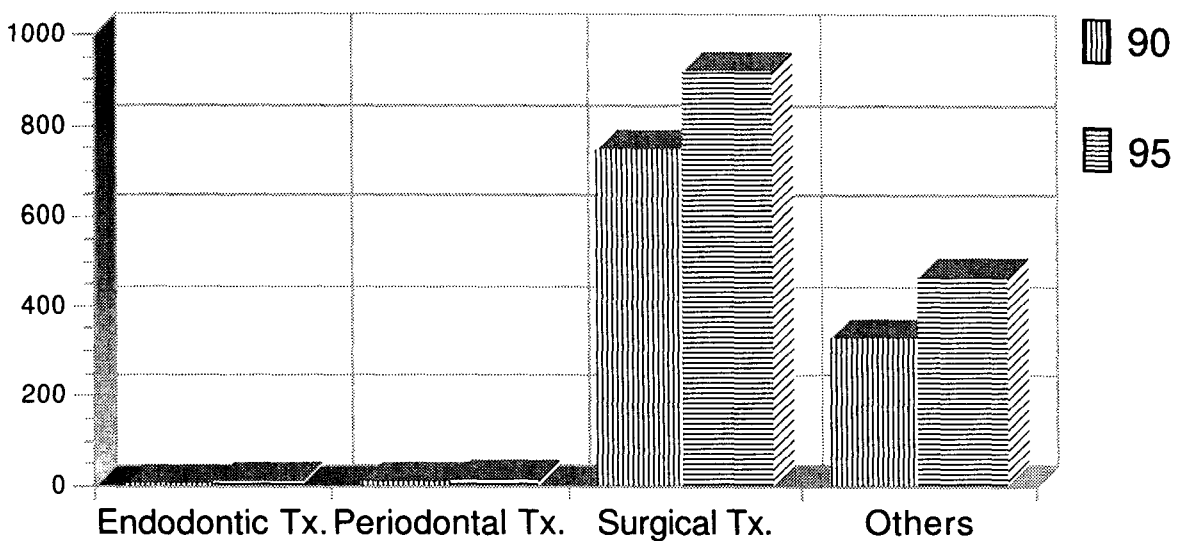


Fig. 6. Case of Extraoral Radiographic Examination at Kyunghee Dental College Hospital (by Objectives : 4 months).



Table 8 and Fig.7 show the cases of panoramic radiographic examination classified by age at each institution. The number of cases was the highest at 3rd decades at both Dental College Hospital and Dental Hospital.

**Table 8.** Cases of Panoramic Radiographic Examination at Institution in 1995 (by Age:4 months)

Institution	Age							
	0-9	10-19	20-29	30-39	40-49	50-59	60-	Total
Dental Clinic	21	53	43	23	47	22	3	212
Dental Hospital	47	69	119	94	88	82	70	569
Dental College Hospital	163	198	368	288	195	188	130	1530

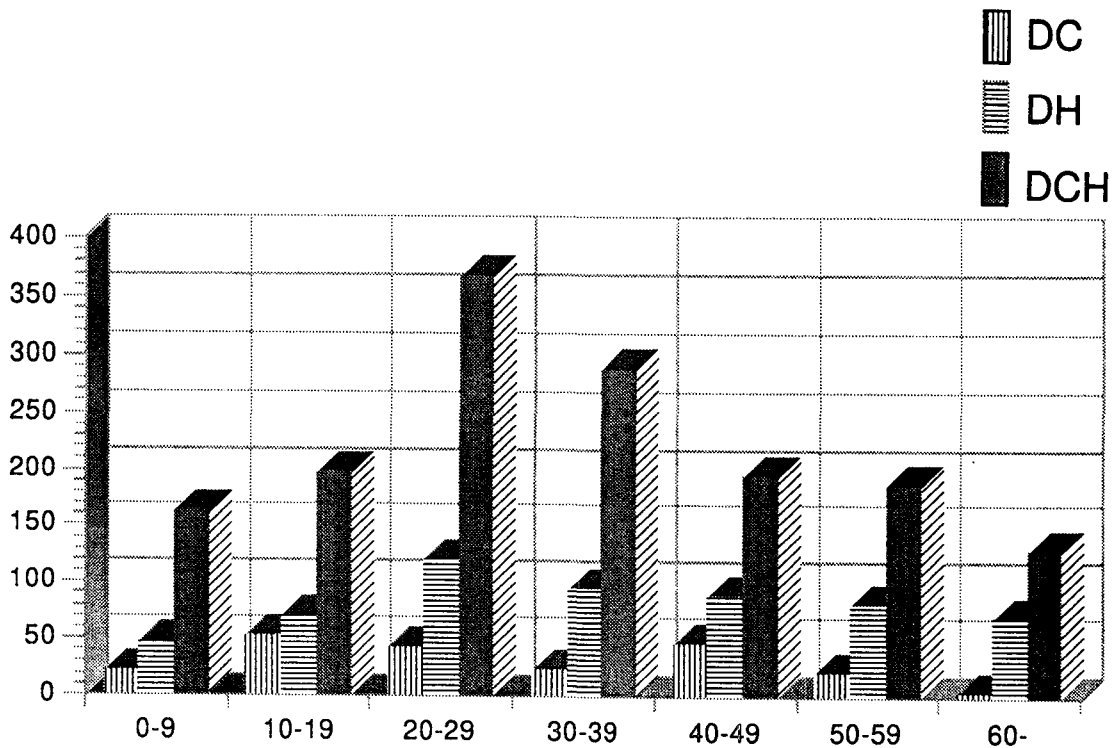
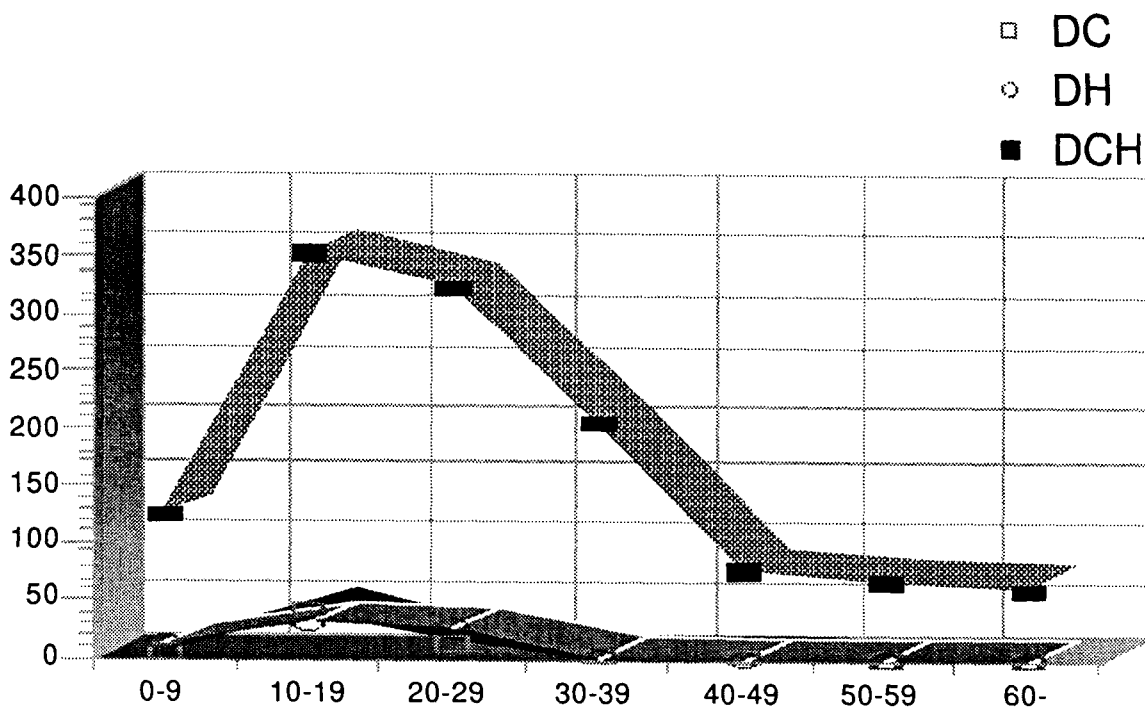


Fig. 7. Cases of Panoramic Radiographic Examination at Institution in 1995 (by Age : 4 months)  
 DC : Dental Clinic  
 DH : Dental Hospital  
 DCH : Dental College Hospital

Table 9 and Fig.8 show the cases of other extraoral radiographic examination classified by age at each institution. The number was the highest at 2nd decades at all institutions.

**Table 9.** Cases of Other Extraoral Radiographic Examination at Institution in 1995(by Age:4 months)

Institution	Age							
	0-9	10-19	20-29	30-39	40-49	50-59	60-	Total
Dental Clinic	6	42	15	2	2	0	0	67
Dental Hospital	12	31	26	2	1	0	1	73
Dental College Hospital	124	354	324	206	77	67	62	1214

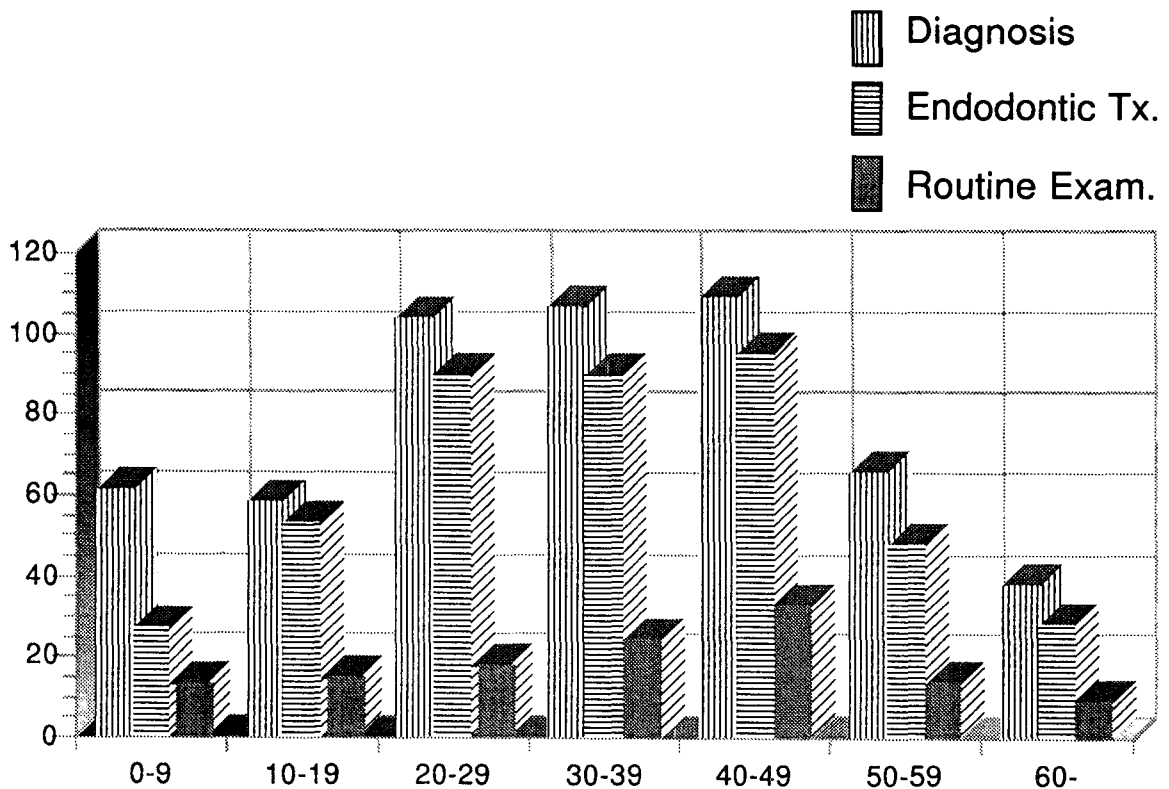


**Fig. 8.** Cases of Other Extraoral Radiographic Examination at Institution in 1995 (by Age : 4 months).

Table 10 and Fig.9 show the cases of intraoral radiographic examination classified by objectives at 52 Dental Clinics. The number of cases was high at 3rd, 4th and 5th decades for the purpose of diagnosis and endodontic treatment.

**Table 10.** Cases of Intraoral Radiographic Examination at Dental Clinic in 1995(52 Dental Clinics:by Objectives : 4 months)

Objectives	Age							Subtotal
	0-9	10-19	20-29	30-39	40-49	50-59	60-	
Diagnosis	61	58	104	107	109	66	38	543
Endodontic Tx.	27	53	90	90	95	48	28	431
Routine Exam.	13	15	18	24	33	14	9	126
Total	101	126	212	221	237	128	75	1100

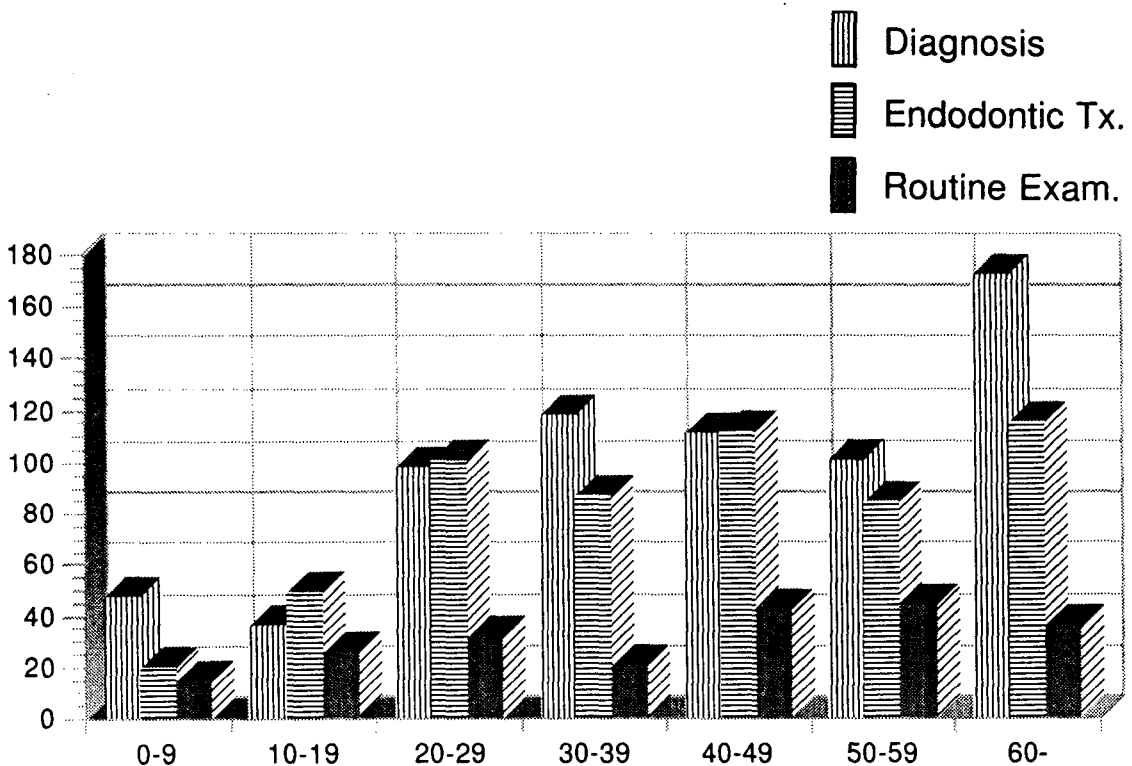


**Fig. 9.** Cases of Intraoral Radiographic Examination at Dental Clinic (by Objectives : 4 months).

Table 11 and Fig.10 show the cases of intraoral radiographic examination classified by objectives at 14 Dental Hospitals. The number of cases was the highest at 7th decades for the purpose of diagnosis.

**Table 11.** Cases of Intraoral Radiographic Examination at Dental Hospital in 1995(14 Dental Hospitals:by Objectives:4 months)

Objectives \ Age	Age							Subtotal
	0-9	10-19	20-29	30-39	40-49	50-59	60-	
Diagnosis	47	36	98	118	111	101	172	683
Endodontic Tx.	20	48	101	87	112	84	115	568
Routine Exam.	15	26	32	21	42	44	36	216
Total	82	111	231	226	265	229	323	1467

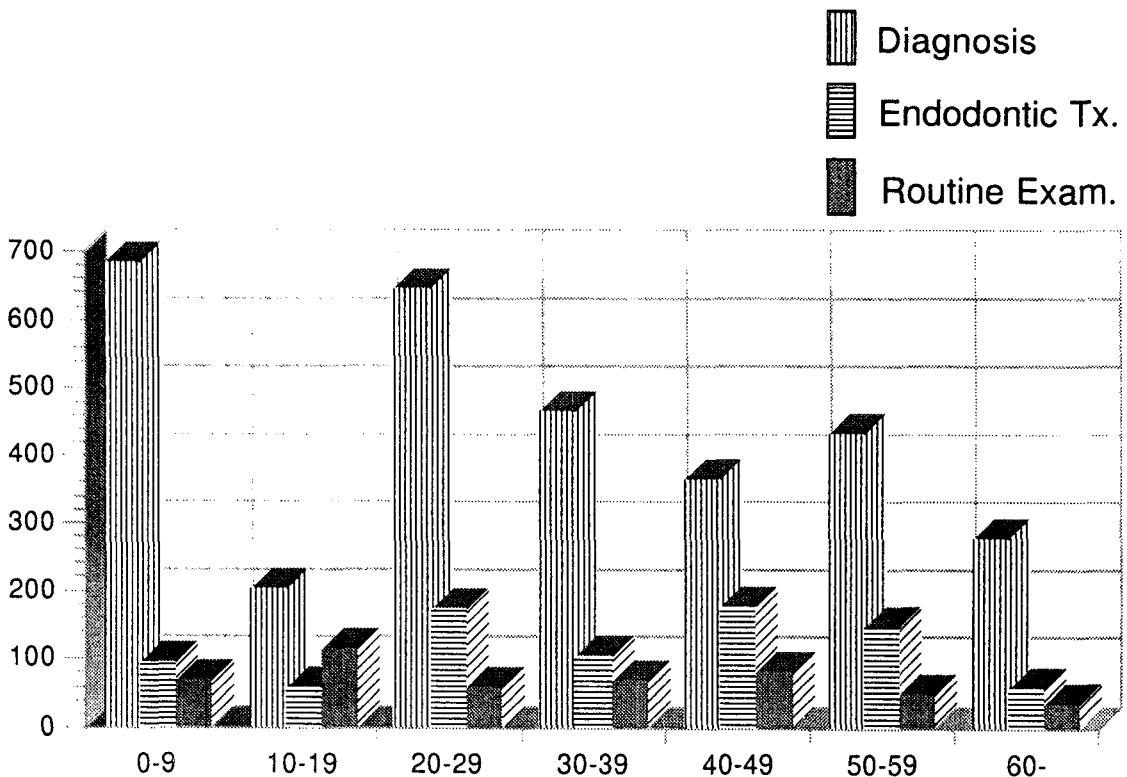


**Fig. 10.** Cases of Intraoral Radiographic Examination at Dental Hospital (by Objectives : 4 months).

Table 12 and Fig.11 show the cases of intraoral radiographic examination classified by age at 6 Dental College Hospitals. The number of cases was the highest for the purpose of diagnosis at all decades.

**Table 12.** Cases of Intraoral Radiographic Examination at Dental College Hospital in 1995(6 Dental College Hospitals:by Age: 4 months)

Objectives \ Age	0-9	10-19	20-29	30-39	40-49	50-59	60-	Subtotal
Diagnosis	684	201	645	465	365	433	271	3064
Endodontic Tx.	93	59	171	103	175	147	59	807
Routine Exam.	68	114	57	70	82	48	35	474
Total	845	374	873	638	622	628	365	4345



**Fig. 11.** Cases of Intraoral Radiographic Examination at Dental College Hospital (by Age : 4 months).

## Conclusion

The future education of OMFR must be changed to cope with the advancing digital imaging system and computer software. Also computer-assisted instruction<sup>5,6</sup> and computer-based decision systems<sup>7</sup> can be expected. And a teleradiology system<sup>8</sup> for oral lesions would permit radiographic consultation between the OMF radiologist and a general dentist in the near future. Therefore, the OMF radiologist will play an important role for oral health care.

I hope that this article will provide the stimulus to advance the future education and the oral health care for the patient.

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