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APPENDIX

APPENDIX

Part I. Measurement of Intra- & Inter-examiner reliability

Cohen's kappa coefficient is a statistical measure of inter-examiner reliability. The example data were analyzed with MedCalc statistical program.

The example data of leakage score that evaluated by two examiners which rating two times (after a two-week interval).

Leakage scores / Samples	1st examiner		2nd examiner	
	1	2	1	2
1	2	2	1	2
2	2	2	2	2
3	2	2	2	2
4	2	2	2	2
5	2	2	2	2
6	2	2	3	3
7	2	2	2	2
8	2	2	2	2
9	0	0	1	1
10	0	0	0	0
11	1	1	1	1
12	1	0	0	0
13	1	1	0	0
14	2	2	1	1
15	0	0	0	0
16	1	1	1	1
17	1	1	1	1
18	0	2	1	0
19	0	0	0	0

20	0	0	0	0
21	0	0	0	0
22	1	1	0	0
23	0	1	0	0
24	0	0	0	0
25	0	0	1	0
26	4	4	4	4
27	4	4	4	4
28	1	2	2	2
29	2	2	2	2
30	1	2	2	2

Cohen's Kappa (Altman, 1991)

Value of Kappa	Strength of agreement
< 0.20	Poor
0.21-0.40	Fair
0.41-0.60	Moderate
0.61-0.80	Good
0.81-1.00	Very good

Measurement of intra-examiner reliability (1st examiner) was evaluated by repeated rating.

2nd score	1st score				
	0	1	2	4	
0	8	1	0	0	9 (30.0%)
1	1	5	0	0	6 (20.0%)
2	1	2	10	0	13 (43.3%)
4	0	0	0	2	2 (6.7%)
	10(33.3%)	8(26.7%)	10(33.3%)	2 (6.7%)	30

Weighted Kappa	0.811
Standard error (Kw'=0)	0.136
Standard error (Kw'#0)	0.084

For these example data, it could be concluded that the intra-examiner reliability is satisfactory, due to the obtained Kappa of 0.811. The concordance of a single examiner rating two times (after a two-week interval) is very good.

Measurement of intra-examiner reliability (2nd examiner) was evaluated by repeated rating.

2nd score	1st score					
	0	1	2	3	4	
0	10	2	0	0	0	12 (40.0%)
1	0	5	0	0	0	5 (16.7%)
2	0	1	9	0	0	10 (33.3%)
3	0	0	0	1	0	1 (3.3%)
4	0	0	0	0	2	2 (6.7%)
	13(43.3%)	8(26.7%)	9(30.0%)	1(3.3%)	2(6.7%)	30

Weighted Kappa	0.920
Standard error (Kw'=0)	0.127
Standard error (Kw'#0)	0.046

For these example data, it could be concluded that the intra-examiner reliability is satisfactory, due to the obtained Kappa of 0.920. The concordance of a single rater rating two times (after a two-week interval) is very good.

Measurement of inter-examiner reliability was evaluated between two examiners.

2nd examiner	1st examiner					
	0	1	2	3	4	
0	9	3	0	0	0	12 (40.0%)
1	1	3	1	0	0	5 (16.7%)
2	0	2	8	0	0	10 (33.3%)
3	0	0	1	0	0	1 (3.3%)
4	0	0	0	0	2	2 (6.7%)
	10(33.3%)	8(26.7%)	10(33.3%)	0(0.0%)	2(6.7%)	30

Weighted Kappa	0.783
Standard error (Kw'=0)	0.128
Standard error (Kw'#0)	0.075

For these example data, it could be concluded that the inter-examiner reliability is satisfactory, due to the obtained Kappa of 0.783. The concordance between two examiner ratings is good.

Part II **Microleakage test**

Data of microleakage scores at enamel and dentin margins from cavities bonded with Optibond FL (used following manufacture's instruction).

Group 1	1st examiner		2nd examiner		Concluded score	
	Enamel	Dentin	Enamel	Dentin	Enamel	Dentin
1	0	2	0	2	0	2
2	0	1	0	1	0	1
3	0	1	0	2	0	1
4	1	3	0	3	0	3
5	1	2	1	2	1	2
6	1	2	0	2	0	2
7	1	1	1	2	1	1
8	1	2	0	2	1	2
9	1	2	0	2	1	2
10	1	1	0	2	1	1
11	1	1	1	2	1	1
12	1	1	1	1	1	1
13	0	1	0	1	0	1
14	0	1	0	1	0	1
15	0	1	0	1	0	1
16	0	1	1	1	0	1
17	0	1	0	2	0	1
18	0	2	0	1	0	1
19	0	1	0	2	0	2
20	0	1	0	1	0	1
21	0	1	1	2	0	1
22	0	2	0	2	0	2

23	0	1	0	1	0	1
24	0	1	0	1	0	1
25	1	2	1	2	1	2
26	0	2	0	2	0	2
27	0	1	0	1	0	1
28	0	2	0	1	0	1
29	0	1	0	1	0	1
30	0	1	0	2	0	1
31	1	1	1	1	1	1
32	0	2	1	2	0	2
33	1	2	0	1	0	1
34	0	2	0	2	0	2
35	0	2	0	2	0	2
36	1	2	0	2	0	2
37	1	2	1	2	1	2
38	0	2	0	2	0	2
39	0	2	1	2	0	2
40	0	2	0	2	0	2

Percentage of disagreement in rating leakage scores at enamel margins 27.5% (11/40)

Percentage of disagreement in rating leakage scores at dentin margins 27.5% (11/40)

Data of microleakage scores at enamel and dentin margins from cavities bonded with Clearfil SE Bond (used following manufacture's instruction).

Group 2	1st examiner		2nd examiner		Concluded score	
	Enamel	Dentin	Enamel	Dentin	Enamel	Dentin
1	0	1	1	2	0	1
2	1	1	0	1	1	1
3	1	1	1	3	1	1
4	1	1	1	2	1	1
5	2	1	2	1	2	1
6	0	1	1	1	0	1
7	1	1	1	1	1	1
8	1	1	2	1	1	1
9	0	1	0	2	0	2
10	0	1	0	2	0	1
11	0	1	0	2	0	1
12	0	1	1	3	1	1
13	1	2	1	1	1	1
14	0	2	0	1	0	1
15	0	1	0	1	0	1
16	0	1	0	1	0	1
17	0	1	0	1	0	1
18	1	1	1	1	1	1
19	1	1	1	1	1	1
20	1	1	1	1	1	1
21	0	2	1	1	2	2
22	0	1	0	2	1	2
23	0	2	0	1	0	1
24	1	1	0	1	0	1

25	0	1	0	1	0	1
26	0	1	0	1	0	1
27	0	1	0	1	0	1
28	1	1	1	1	1	1
29	1	2	1	1	1	1
30	1	1	1	2	1	1
31	1	1	1	1	1	1
32	0	1	1	1	1	1
33	0	1	1	1	1	1
34	0	1	0	1	0	1
35	0	2	0	1	0	1
36	1	1	0	1	0	1
37	1	1	0	1	0	1
38	1	1	1	1	1	1
39	1	1	1	1	1	1
40	0	1	0	1	1	1

Percentage of disagreement in rating leakage scores at enamel margins 27.5% (11/40)

Percentage of disagreement in rating leakage scores at dentin margins 30.0% (12/40)

Data of microleakage scores at enamel and dentin margins from cavities bonded with Clearfil S^3 Bond (used following manufacture's instruction).

Group 3	1st examiner		2nd examiner		Concluded score	
	Enamel	Dentin	Enamel	Dentin	Enamel	Dentin
1	1	2	1	2	1	2
2	1	1	1	1	1	1
3	2	1	2	1	2	1
4	1	1	2	2	1	1
5	2	1	3	1	3	1
6	1	2	1	2	1	2
7	1	1	2	2	2	1
8	2	1	2	2	2	1
9	2	1	2	1	2	1
10	2	1	2	1	2	1
11	1	1	2	1	2	1
12	2	1	2	1	2	1
13	2	2	0	2	2	2
14	2	2	1	2	2	2
15	1	1	1	1	1	1
16	1	1	1	2	1	2
17	1	2	1	1	1	2
18	1	2	1	2	2	2
19	1	2	1	2	1	2
20	1	2	1	2	1	2
21	2	1	1	1	2	1
22	2	1	2	1	2	1
23	1	1	2	1	2	1
24	1	1	2	1	1	1

25	1	1	1	1	1	1
26	1	1	1	2	1	1
27	1	1	1	1	1	1
28	1	1	1	1	1	1
29	0	1	0	1	0	1
30	1	1	1	1	1	1
31	1	1	1	1	1	1
32	1	1	1	1	1	1
33	2	1	1	2	2	2
34	2	1	0	2	2	1
35	2	1	0	1	2	1
36	2	2	2	2	2	2
37	2	1	2	1	2	1
38	2	1	2	1	2	1
39	2	1	2	1	2	1
40	2	1	2	1	2	1

Percentage of disagreement in rating leakage scores at enamel margins 27.5% (11/40)

Percentage of disagreement in rating leakage scores at dentin margins 20.0% (8/40)

Data of microleakage scores at enamel and dentin margins from cavities bonded with Optibond FL (modified application by selective enamel acid etching)

Group 4	1st examiner		2nd examiner		Concluded score	
	Enamel	Dentin	Enamel	Dentin	Enamel	Dentin
1	2	1	2	1	2	1
2	1	1	0	1	0	1
3	1	1	0	1	1	1
4	1	1	2	1	1	1
5	1	1	0	2	0	1
6	0	1	1	1	0	1
7	1	1	1	1	1	1
8	1	1	1	1	1	1
9	1	1	1	1	1	1
10	1	1	1	1	1	1
11	1	1	1	1	1	1
12	1	1	0	1	0	1
13	0	1	0	2	0	1
14	0	1	0	2	0	1
15	0	1	0	2	0	1
16	0	1	1	1	0	1
17	0	-	0	-	0	-
18	0	-	0	-	0	-
19	0	-	0	-	0	-
20	0	-	1	-	0	-
21	0	1	0	1	0	1
22	0	1	0	1	0	1
23	0	1	0	1	0	1
24	1	1	0	1	0	1

25	0	1	0	1	0	1
26	0	1	0	1	0	1
27	0	1	1	1	0	1
28	0	1	0	1	0	1
29	1	1	0	2	0	1
30	0	1	0	1	0	1
31	0	1	0	1	0	1
32	1	1	0	1	0	1
33	0	1	0	1	0	1
34	0	1	0	1	0	1
35	0	1	0	1	0	1
36	0	1	0	1	0	1
37	0	1	0	1	0	1
38	0	1	0	1	0	1
39	0	1	0	1	0	1
40	1	1	0	1	0	1

Percentage of disagreement in rating leakage scores at enamel margins 27.5% (11/40)

Percentage of disagreement in rating leakage scores at dentin margins 12.5% (5/40)

Data of microleakage scores at enamel and dentin margins from cavities bonded with Clearfil SE Bond (modified application by selective enamel acid etching).

Group 5	1st examiner		2nd examiner		Concluded score	
	Enamel	Dentin	Enamel	Dentin	Enamel	Dentin
1	2	1	2	2	2	1
2	2	2	2	2	2	2
3	2	2	2	2	2	2
4	2	2	2	2	2	2
5	2	2	2	2	2	2
6	2	3	2	3	2	3
7	2	2	2	2	2	2
8	2	2	2	2	2	2
9	0	1	0	1	0	1
10	0	1	0	1	0	1
11	0	1	0	1	0	1
12	0	1	0	2	0	1
13	0	1	0	2	0	1
14	0	1	0	1	0	1
15	1	1	1	1	1	1
16	0	1	0	1	0	1
17	0	1	0	1	0	1
18	0	1	0	1	0	1
19	0	1	1	1	0	1
20	0	1	0	1	0	1
21	0	1	0	1	0	1
22	0	1	0	1	0	1
23	1	1	0	1	1	1
24	0	1	0	1	0	1

25	-	2	-	2	-	2
26	-	1	-	1	-	1
27	-	1	-	1	-	1
28	-	1	-	1	-	1
29	0	1	0	1	0	1
30	1	1	0	1	1	1
31	1	1	0	1	0	1
32	1	2	0	1	0	1
33	0	1	0	1	0	1
34	0	2	0	2	0	2
35	0	1	0	1	0	1
36	0	1	0	1	0	1
37	1	1	1	1	1	1
38	1	1	1	1	1	1
39	0	1	0	1	0	1
40	0	1	0	1	0	1

Percentage of disagreement in rating leakage scores at enamel margins 7.5% (3/40)

Percentage of disagreement in rating leakage scores at dentin margins 10.0% (4/40)

Data of microleakage scores at enamel and dentin margins from cavities bonded with Clearfil S^{3}Bond (modified application by selective enamel acid etching).

Group 6	1st examiner		2nd examiner		Concluded score	
	Enamel	Dentin	Enamel	Dentin	Enamel	Dentin
1	0	2	0	2	0	2
2	1	2	1	1	1	1
3	0	1	0	1	0	1
4	1	1	1	2	1	1
5	1	1	1	1	1	1
6	1	1	1	2	1	1
7	1	1	1	2	1	2
8	2	1	2	1	2	1
9	1	3	2	4	2	4
10	2	4	2	4	2	4
11	0	4	1	4	1	4
12	1	1	2	2	2	2
13	1	2	2	2	2	2
14	2	1	2	2	2	2
15	1	3	1	3	1	3
16	1	1	1	1	1	1
17	1	1	1	2	1	2
18	1	2	2	2	2	2
19	1	2	0	2	1	2
20	1	2	1	2	1	2
21	1	1	1	1	1	1
22	0	1	1	2	1	2
23	1	1	1	1	1	1
24	2	1	2	1	2	1
25	1	1	2	1	1	1

26	1	1	0	1	1	1
27	1	1	1	1	1	1
28	1	1	1	1	1	1
29	0	2	1	2	1	2
30	1	1	1	1	1	1
31	1	1	1	1	2	1
32	1	1	1	1	1	1
33	1	1	1	1	1	1
34	2	1	2	1	2	1
35	2	1	2	1	2	1
36	1	1	2	1	2	1
37	1	1	2	1	1	1
38	2	2	2	2	2	2
39	1	1	1	1	1	1
40	1	2	1	2	1	2

Percentage of disagreement in rating leakage scores at enamel margins 27.5% (11/40)

Percentage of disagreement in rating leakage scores at dentin margins 15.0% (6/40)

Leakage scores for adhesive groups at enamel margin.

Group	Enamel leakage				Total
	No dye penetration	Dye penetration no more than 1/3	Dye penetration no more than 2/3	Dye penetration more than 2/3	
Optibond FL	30	10	0	0	40
Clearfil SE	19	20	1	0	40
Clearfil S^3	1	17	21	1	40
Modified Optibond	32	7	1	0	40
Modified Clearfil SE	24	4	8	0	36
Modified Clearfil S^3	2	25	13	0	40
Total	108	83	44	1	236

Frequency and percentages of leakage score at enamel margin.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No dye penetration	108	45.0	45.8	45.8
	Dye penetration no more than 1/3	83	34.6	35.2	80.9
	Dye penetration no more than 2/3	44	18.3	18.6	99.6
	Dye penetration more than 2/3	1	.4	.4	100.0
	Total	236	98.3	100.0	
Missing	9	4	1.7		
Total		240	100.0		

Leakage scores for adhesive groups at dentin margin.

Group	Dentin leakage				Total
	Dye penetration no more than 1/3	Dye penetration no more than 2/3	Dye penetration more than 2/3	Dye penetration along the axial wall	
Optibond FL	22	17	1	0	40
Clearfil SE	37	3	0	0	40
Clearfil S^3	29	11	0	0	40
Modified Optibond	36	0	0	0	36
Modified Clearfil SE	31	8	1	0	40
Modified Clearfil S^3	23	13	1	3	40
Total	178	52	3	3	236

Frequency and percentages of leakage score at dentin margin.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Dye penetration no more than 1/3	178	74.2	75.4	75.4
	Dye penetration no more than 2/3	52	21.7	22.0	97.5
	Dye penetration more than 2/3	3	1.3	1.3	98.7
	Dye penetration along the axial wall	3	1.3	1.3	100.0
	Total	236	98.3	100.0	
Missing	9	4	1.7		
Total		240	100.0		

Statistical analysis was performed utilizing the Chi-Square test for analyzing whether a frequency distribution of microleakage scores among adhesive groups.

Distribution of enamel leakage scores for the adhesive groups.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Adhesive group * enamel leakage	236	98.3%	4	1.7%	240	100.0%

Adhesive group * enamel leakage Crosstabulation

		enamel leakage				Total
		No leakage	no more than 1/3	no more than 2/3	more than 2/3	
Optibond FL	Count	30	10	0	0	40
	% within group	75.0%	25.0%	.0%	.0%	100.0%
Clearfil SE	Count	19	20	1	0	40
	% within group	47.5%	50.0%	2.5%	.0%	100.0%
Clearfil 3s	Count	1	17	21	1	40
	% within group	2.5%	42.5%	52.5%	2.5%	100.0%
Modified Optibond	Count	32	7	1	0	40
	% within group	80.0%	17.5%	2.5%	.0%	100.0%
Modified Clearfil SE	Count	23	5	8	0	36
	% within group	63.9%	13.9%	22.2%	.0%	100.0%
Modified Clearfil 3s	Count	2	25	13	0	40
	% within group	5.0%	62.5%	32.5%	.0%	100.0%
Total	Count	107	84	44	1	236
	% within group	45.3%	35.6%	18.6%	.4%	100.0%

Chi-Square test

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	124.890[a]	15	.000
Likelihood Ratio	147.086	15	.000
Fisher's Exact Test	138.691		
Linear-by-Linear Association	15.228[b]	1	.000
N of valid Cases	236		

e. 6 cells (25.0%) have expected count less than5. the minimum expected count is .15.

f. The standardized statistic is 3.902.

Chi-Square test demonstrated relationship between adhesive groups and microleakage score at enamel margin *(p= 0.000)*.

Distribution of dentin leakage scores for the adhesive groups.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Adhesive group * dentin leakage	236	98.3%	4	1.7%	240	100.0%

Adhesive group * dentin leakage Crosstabulation

		Dentin leakage				
		no more than 1/3	no more than 2/3	more than 2/3	along axial wall	Total
Optibond FL	Count	22	17	1	0	40
	% within group	55.0%	42.5%	2.5%	.0%	100.0%
Clearfil SE	Count	37	3	0	0	40
	% within group	92.5%	7.5%	.0%	.0%	100.0%
Clearfil 3s	Count	29	11	0	0	40
	% within group	72.5%	27.5%	.0%	.0%	100.0%
Modified Optibond	Count	36	0	0	0	36
	% within group	100.0%	.0%	.0%	.0%	100.0%
Modified Clearfil SE	Count	31	8	1	0	40
	% within group	77.5%	20.0%	2.5%	.0%	100.0%
Modified Clearfil 3s	Count	23	13	1	3	40
	% within group	57.5%	32.5%	2.5%	7.5%	100.0%
Total	Count	178	52	3	3	236
	% within group	75.4%	22.0%	1.3%	1.3%	100.0%

Chi-Square test

	Value	df	Asymp.Sig. (2-sided)
Pearson Chi-Square	47.990[a]	15	.000
Likelihood Ratio	52.432	15	.000
Fisher's Exact Test	43.776		
Linear-by-Linear Association	1.525[b]	1	.217
N of valid Cases	236		

g. 12 cells (50.0%) have expected count less than5. the minimum expected count is .46.

h. The standardized statistic is 1.235.

Chi-Square test demonstrated relationship between adhesive groups and microleakage score at dentin margin *(p= 0.000)*.

Statistical analysis was performed utilizing the Wilcoxon Signed Rank test for comparing the microleakage scores among adhesive groups which were applied following the manufacturer's instruction and adhesives which were applied following modified protocol both at enamel margin and dentin margin.

Wilcoxon Signed Ranks Test

Ranks

		N	Mean Rank	Sum of Ranks
OFL dentin leakage - OFL enamel leakage	Negative Ranks	0(a)	.00	.00
	Positive Ranks	33(b)	17.00	561.00
	Ties	7(c)		
	Total	40		
MOFL dentin leakage - MOFL enamel leakage	Negative Ranks	1(d)	15.00	15.00
	Positive Ranks	28(e)	15.00	420.00
	Ties	7(f)		
	Total	36		
MOFL enamel leakage - OFL enamel leakage	Negative Ranks	5(g)	4.00	20.00
	Positive Ranks	3(h)	5.33	16.00
	Ties	32(i)		
	Total	40		
MOFL dentin leakage - OFL dentin leakage	Negative Ranks	6(j)	3.50	21.00
	Positive Ranks	0(k)	.00	.00
	Ties	30(l)		
	Total	36		

a OFL dentin leakage < OFL enamel leakage

b OFL dentin leakage > OFL enamel leakage

c OFL dentin leakage = OFL enamel leakage

d MOFL dentin leakage < MOFL enamel leakage

e MOFL dentin leakage > MOFL enamel leakage

f MOFL dentin leakage = MOFL enamel leakage

g MOFL enamel leakage < OFL enamel leakage

h MOFL enamel leakage > OFL enamel leakage

i MOFL enamel leakage = OFL enamel leakage

j MOFL dentin leakage < OFL dentin leakage

k MOFL dentin leakage > OFL dentin leakage

l MOFL dentin leakage = OFL dentin leakage

Test Statistics

	OFL dentin leakage - OFL enamel leakage	MOFL dentin leakage - MOFL enamel leakage	MOFL enamel leakage - OFL enamel leakage	MOFL dentin leakage - OFL dentin leakage
Z	-5.476[(a)]	-5.014[(a)]	-.302[(b)]	-2.333[(b)]
Asymp. Sig. (2-tailed)	.000	.000	.763	.020

a Based on negative ranks.

b Based on positive ranks.

Ranks

		N	Mean Rank	Sum of Ranks
CSE dentin leakage - CSE enamel leakage	Negative Ranks	1(a)	10.00	10.00
	Positive Ranks	20(b)	11.05	221.00
	Ties	19(c)		
	Total	40		
MSE dentin leakage - MSE enamel leakage	Negative Ranks	1(d)	13.00	13.00
	Positive Ranks	25(e)	13.52	338.00
	Ties	10(f)		
	Total	36		
MSE enamel leakage - CSE enamel leakage	Negative Ranks	12(g)	10.00	120.00
	Positive Ranks	9(h)	12.33	111.00
	Ties	15(i)		
	Total	36		
MSE dentin leakage - CSE dentin leakage	Negative Ranks	3(j)	6.00	18.00
	Positive Ranks	9(k)	6.67	60.00
	Ties	28(l)		
	Total	40		

a CSE dentin leakage < CSE enamel leakage

b CSE dentin leakage > CSE enamel leakage

c CSE dentin leakage = CSE enamel leakage

d MSE dentin leakage < MSE enamel leakage

e MSE dentin leakage > MSE enamel leakage

f MSE dentin leakage = MSE enamel leakage

g MSE enamel leakage < CSE enamel leakage

h MSE enamel leakage > CSE enamel leakage

i MSE enamel leakage = CSE enamel leakage

j MSE dentin leakage < CSE dentin leakage

k MSE dentin leakage > CSE dentin leakage

l MSE dentin leakage = CSE dentin leakage

Test Statistics

	CSE dentin leakage - CSE enamel leakage	MSE dentin leakage - MSE enamel leakage	MSE enamel leakage - CSE enamel leakage	MSE dentin leakage - CSE dentin leakage
Z	-4.031[(a)]	-4.642[(a)]	-.172[(b)]	-1.807[(a)]
Asymp. Sig. (2-tailed)	.000	.000	.864	.071

a Based on negative ranks.

b Based on positive ranks.

Ranks

		N	Mean Rank	Sum of Ranks
C3S dentin leakage - C3S enamel leakage	Negative Ranks	8(a)	7.88	63.00
	Positive Ranks	6(b)	7.00	42.00
	Ties	26(c)		
	Total	40		
M3S dentin leakage - M3S enamel leakage	Negative Ranks	6(d)	7.50	45.00
	Positive Ranks	13(e)	11.15	145.00
	Ties	21(f)		
	Total	40		
M3S enamel leakage - C3S enamel leakage	Negative Ranks	19(g)	10.00	190.00
	Positive Ranks	0(h)	.00	.00
	Ties	21(i)		
	Total	40		
M3S dentin leakage - C3S dentin leakage	Negative Ranks	18(j)	10.50	189.00
	Positive Ranks	6(k)	18.50	111.00
	Ties	16(l)		
	Total	40		

a C3S dentin leakage < C3S enamel leakage

b C3S dentin leakage > C3S enamel leakage

c C3S dentin leakage = C3S enamel leakage

d M3S dentin leakage < M3S enamel leakage

e M3S dentin leakage > M3S enamel leakage

f M3S dentin leakage = M3S enamel leakage

g M3S enamel leakage < C3S enamel leakage

h M3S enamel leakage > C3S enamel leakage

i M3S enamel leakage = C3S enamel leakage

j M3S dentin leakage < C3S dentin leakage

k M3S dentin leakage > C3S dentin leakage

l M3S dentin leakage = C3S dentin leakage

Test Statistics

	C3S dentin leakage - C3S enamel leakage	M3S dentin leakage - M3S enamel leakage	M3S enamel leakage - C3S enamel leakage	M3S dentin leakage - C3S dentin leakage
Z	-.728[a]	-2.114[b]	-4.185[a]	-1.199[a]
Asymp. Sig. (2-tailed)	.467	.035	.000	.231

a Based on positive ranks.

b Based on negative ranks.

Ranks

		N	Mean Rank	Sum of Ranks
CSE enamel leakage - OFL enamel leakage	Negative Ranks	5(a)	11.50	57.50
	Positive Ranks	17(b)	11.50	195.50
	Ties	18(c)		
	Total	40		
C3S enamel leakage - OFL enamel leakage	Negative Ranks	0(d)	.00	.00
	Positive Ranks	40(e)	20.50	820.00
	Ties	0(f)		
	Total	40		
MSE enamel leakage - OFL enamel leakage	Negative Ranks	5(g)	6.00	30.00
	Positive Ranks	11(h)	9.64	106.00
	Ties	20(i)		
	Total	36		
M3S enamel leakage - OFL enamel leakage	Negative Ranks	0(j)	.00	.00
	Positive Ranks	33(k)	17.00	561.00
	Ties	7(l)		
	Total	40		

a CSE enamel leakage < OFL enamel leakage

b CSE enamel leakage > OFL enamel leakage

c CSE enamel leakage = OFL enamel leakage

d C3S enamel leakage < OFL enamel leakage

e C3S enamel leakage > OFL enamel leakage

f C3S enamel leakage = OFL enamel leakage

g MSE enamel leakage < OFL enamel leakage

h MSE enamel leakage > OFL enamel leakage

i MSE enamel leakage = OFL enamel leakage

j M3S enamel leakage < OFL enamel leakage

k M3S enamel leakage > OFL enamel leakage

l M3S enamel leakage = OFL enamel leakage

Test Statistics

	CSE enamel leakage - OFL enamel leakage	C3S enamel leakage - OFL enamel leakage	MSE enamel leakage - OFL enamel leakage	M3S enamel leakage - OFL enamel leakage
Z	-2.558[(a)]	-5.690[(a)]	-2.049[(a)]	-5.304[(a)]
Asymp. Sig. (2-tailed)	.011	.000	.040	.000

a Based on negative ranks.

b Based on positive ranks.

Ranks

		N	Mean Rank	Sum of Ranks
CSE dentin leakage - OFL dentin leakage	Negative Ranks	6(a)	4.67	28.00
	Positive Ranks	2(b)	4.00	8.00
	Ties	32(c)		
	Total	40		
C3S dentin leakage - CSE dentin leakage	Negative Ranks	1(d)	14.50	14.50
	Positive Ranks	27(e)	14.50	391.50
	Ties	12(f)		
	Total	40		
MOFL dentin leakage - CSE dentin leakage	Negative Ranks	3(g)	2.00	6.00
	Positive Ranks	0(h)	.00	.00
	Ties	33(i)		
	Total	36		
M3S dentin leakage - CSE dentin leakage	Negative Ranks	1(j)	7.00	7.00
	Positive Ranks	16(k)	9.13	146.00
	Ties	23(l)		
	Total	40		

a CSE dentin leakage < OFL dentin leakage

b CSE dentin leakage > OFL dentin leakage

c CSE dentin leakage = OFL dentin leakage

d C3S dentin leakage < CSE dentin leakage

e C3S dentin leakage > CSE dentin leakage

f C3S dentin leakage = CSE dentin leakage

g MOFL dentin leakage < CSE dentin leakage

h MOFL dentin leakage > CSE dentin leakage

i MOFL dentin leakage = CSE dentin leakage

j M3S dentin leakage < CSE dentin leakage

k M3S dentin leakage > CSE dentin leakage

l M3S dentin leakage = CSE dentin leakage

Test Statistics

	CSE dentin leakage - OFL dentin leakage	C3S dentin leakage - CSE dentin leakage	MOFL dentin leakage - CSE dentin leakage	M3S dentin leakage - CSE dentin leakage
Z	-1.508[a]	-4.914[b]	-1.732[a]	-3.473[b]
Asymp. Sig. (2-tailed)	.132	.000	.083	.001

a Based on positive ranks.

b Based on negative ranks.

Ranks

		N	Mean Rank	Sum of Ranks
MOFL dentin leakage - CSE dentin leakage	Negative Ranks	3(a)	2.00	6.00
	Positive Ranks	0(b)	.00	.00
	Ties	33(c)		
	Total	36		
MOFL dentin leakage - C3S dentin leakage	Negative Ranks	25(d)	13.00	325.00
	Positive Ranks	0(e)	.00	.00
	Ties	11(f)		
	Total	36		
MSE dentin leakage - MOFL dentin leakage	Negative Ranks	0(g)	.00	.00
	Positive Ranks	9(h)	5.00	45.00
	Ties	27(i)		
	Total	36		
M3S dentin leakage - MOFL dentin leakage	Negative Ranks	0(j)	.00	.00
	Positive Ranks	13(k)	7.00	91.00
	Ties	23(l)		
	Total	36		

a MOFL dentin leakage < CSE dentin leakage

b MOFL dentin leakage > CSE dentin leakage

c MOFL dentin leakage = CSE dentin leakage

d MOFL dentin leakage < C3S dentin leakage

e MOFL dentin leakage > C3S dentin leakage

f MOFL dentin leakage = C3S dentin leakage

g MSE dentin leakage < MOFL dentin leakage

h MSE dentin leakage > MOFL dentin leakage

i MSE dentin leakage = MOFL dentin leakage

j M3S dentin leakage < MOFL dentin leakage

k M3S dentin leakage > MOFL dentin leakage

l M3S dentin leakage = MOFL dentin leakage

Test Statistics

	MOFL dentin leakage - CSE dentin leakage	MOFL dentin leakage - C3S dentin leakage	MSE dentin leakage - MOFL dentin leakage	M3S dentin leakage - MOFL dentin leakage
Z	-1.732[(a)]	-5.000[(a)]	-2.887[(b)]	-3.307[(b)]
Asymp. Sig. (2-tailed)	.083	.000	.004	.001

a Based on positive ranks.

b Based on negative ranks.

BIOGRAPHY

Chuthinat Intakanok was born in Phetchabun province, on February 15, 1980. She studied at Chulalongkorn University in 1997-2003 for her undergraduate degree. She completed a Bachelor's Degree in Dentistry from the Faculty of Dentistry. After graduation, she worked as a dentist in the Dental Department, Lomsak Hospital, Phetchabun. Since 2006, she enrolled in the Master's degree program in Operative Dentistry at Chulalongkorn University in Bangkok.