

## COMPARISON OF OPERATIVE TECHNIQUES BETWEEN FEMALE AND MALE DENTISTS IN CLASS 2 AND CLASS 5 RESIN COMPOSITE RESTORATIONS

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### ABSTRACT

This study aimed to assess whether the gender of the dental practitioner affects operative techniques in class 2 and class 5 resin composite restorations. In 2008, a nationwide survey was given to Korean dentists. Total 12,193 e-mails were distributed, 2,632 were opened by recipients, and 840 responses were collected. Of the respondents, 78.9% were male and 21.1% were female. The gender distribution in the age groups between respondents and the total population did not differ ( $p > 0.05$ ). A chi-square test was used to compare technical differences between female and male dentists. A multiple logistic regression analysis was performed to assess the association between gender and operative techniques in resin composite restoration. For class 2 resin composite restoration, female dentists were 1.87 times more likely than male dentists to do multiple incremental fillings (four layers or more) and 2.72 times more likely than males to spend 30 minutes or more for the treatment ( $p < 0.05$ ). For class 5 resin composite restoration, female dentists were 2.69 times more likely than their male counterparts to use a cavity base or liner, 1.83 times more likely to do multiple incremental fillings (four layers or more) and 1.63 times more likely to spend 20 minutes or more for the procedure ( $p < 0.05$ ). The gender factor was influential to individual operative techniques in restorative treatment. [J Kor Acad Cons Dent 35(2):116-124, 2010]

**Key words:** Survey, Gender difference, Operative technique, Female dentist, Class 2 resin, Class 5 resin

-Received 2010.2.1., revised 2010.3.10., accepted 2010.3.11.-

### I . Introduction

As the numbers of women entering the health professions increase, the gender composition of dentists has been drastically changing.<sup>1)</sup> This trend is similar in Asian countries where the traditional role of women has changed dramatically in terms of career development. In 2006, females comprised of 23.0% of the dentist in South Korea and 24.2% of the dentists in Japan.<sup>2,3)</sup> Although female dentists outnumbered

their male counterparts in some countries, female practitioners still exhibited various gender specific patterns in practice type (public vs. private sector), patient group, employment status, working time, etc.<sup>4-9)</sup> Furthermore, several specified studies based on dental work models have mentioned a gender difference in terms of occupational relationships, professional attitudes, academic contributions, treatment decisions, etc.<sup>4,5,7,8,10-13)</sup> However, it has been rarely studied on gender difference related to dental operation per se. One study showed that female dentists reportedly applied topical anesthesia more often than male dentists before needle injection.<sup>6)</sup> Regarding operative procedures, it is challenging to extract relevant variables for differentiating the individual performances of multiple practitioners. For example,

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\*The authors give special thanks to Korean Dental Association for helping with this survey.

restorative treatment, which comprises the major part of a dentist's workload, may be divided into several procedural steps, including cavity preparation, base or liner placement, filling with restorative materials, etc.<sup>14)</sup> These individual steps may vary based on scientific knowledge, clinical experience, and different maneuver. The operative procedures may be further influenced by practitioners' degree of attentiveness, caring, and other personal characteristics.<sup>7)</sup> We selected direct resin composite restoration for a representative operative model and chose relevant variables for specification. The aim of this study was to assess whether there is an independent effect of gender difference in direct resin composite restoration under consideration of background confounding factors of practitioners which might affect.

## II. Methods

### 1. Sample design

The nationwide survey was projected to all dentists whose contact information was enlisted in the Korean Dental Association. A total of 12,193 dentists (from the 22,663 licensed dentists in Korea as of January in 2008) had registered their e-mail addresses in the membership list and received the questionnaire by e-mail. Among them 2632 respondents were confirmed to have opened the e-mail, and 1,177 clicked the link to the questionnaire to give answers. Within a period of three weeks, 840 responses were received, accounting for 31.9 % of the opened e-mails. The respondent group was analyzed in detail and described elsewhere.<sup>15,16)</sup>

### 2. Questionnaire

The questionnaire was comprised of three parts. The first part contained questions regarding the demographic characteristics of the operator. The second part concerned class 2 resin composite restoration, and the mesioocclusal cavity of the upper second premolar was given as an example for precision. The third part was about class 5 resin composite restoration. An exemplary clinical photo of a noncari-ous cervical lesion was provided to ensure under-



**Figure 1.** Exemplary case of noncari-ous cervical lesion in class 5 resin composite restoration.

standing of the case (Figure 1). Each part was sub-divided into the following items.

#### Part I: Characteristics of dentists

- Year of license acquisition
- Gender
- Practice type (private/ hospital based/ public)
- Practice location (urban/ rural)
- Practice size (number of employees)
- Specialty training (none/ conservative dentistry/ other specialty)

#### Part II: Class 2 resin composite restoration

- Rubber dam usage
- Preferred matrix type
- Number of incremental layers
- Length of operation time
- Primary challenge in operative technique

#### Part III: Class 5 resin composite restoration

- Base or liner application
- Number of incremental layers
- Length of operation time
- Primary postoperative complication

### 3. Statistical analyses

The general characteristics of female and male dentist respondents are presented as a frequency and percentage. For the bivariate evaluation of the technical differences between females and males, a chi-

square test was used for comparison. To assess the multivariate association between gender and operative techniques in class 2 and class 5 composite restorations, a multiple logistic regression analysis was used. The independent direct effects by a gender factor were analyzed after adjustment for other variables showing statistically significant gender differences: year of dental license acquisition, practice type, practice location, practice size, and specialty training. Those dependent variables were dichotomized and used as indicators of the operator's technical variation. Statistical significance was set at  $p < 0.05$ . The statistical package SAS 9.13 (SAS Institute Inc., Cary, NC, USA) was used for the analysis.

### III. Results

#### 1. Characteristics of dentists

Table 1 presents the gender comparisons of back-

ground information of the respondents. They were 78.9% male and 21.1% female. Several statistically significant differences were identified between males and females. More male dentists were included in the older age group who had acquired their licenses before 1992 (males 28.8%; females 14.7%). The gender distribution in the age groups between respondents and the total population did not differ ( $p > 0.05$ ) (data not shown). Because three years of service at either military bases or in community health centers is mandatory for new male graduates in Korea, 16.3% of male dentists worked for public dental health service. Additionally, 15.4 % of male dentists were located in rural areas where the public health services were largely based. Male dentists were more likely to work in small practices with one to three employees (males 41.8%; females 23.7%). Female dentists were more often worked in large practices with more than 10 employees (males 21.4%; females 43.5%). Female dentists were also

**Table 1.** Distributions of male vs. female dentists according to general characteristics

Demographic characteristics	Males n (%)	Females n (%)	p-value
Respondents	663 (78.9)	177 (21.1)	
Year of license acquisition			
2003-2007	200 (30.2)	60 (33.9)	0.0009
1998-2002	180 (27.1)	66 (37.3)	
1993-1997	92 (13.9)	25 (14.1)	
Prior to 1993	191 (28.8)	26 (14.7)	
Practice type			
Private practice	505 (76.2)	142 (80.2)	< 0.0001
Hospital with specialty program	50 (7.5)	34 (19.2)	
Public dental health service	108 (16.3)	1 (0.6)	
Region			
Urban	561 (84.6)	174 (98.3)	< 0.0001
Rural	102 (15.4)	3 (1.7)	
Practice size (number of employees)			
1-3	277 (41.8)	42 (23.7)	< 0.0001
4-6	192 (29.0)	40 (22.6)	
7-9	52 (7.8)	18 (10.2)	
≥ 10	142 (21.4)	77 (43.5)	
Specialty training			
None	261 (39.4)	53 (29.9)	0.0022
Conservative dentistry	88 (13.3)	41 (23.2)	
Other than conservative dentistry	314 (47.4)	83 (46.9)	

more likely to have completed or to currently be in a specialty program of conservative dentistry (males 13.3%; females 23.2%).

## 2. Operative techniques in class 2 composite restoration

Table 2 presents the results of a gender comparison of the operative techniques in class 2 resin composite restoration. There were no differences between male and female dentists regarding the frequency of rubber dam usage and the preferred type of matrix. For the number of increments, 52.0% of male dentists performed incremental filling with two to three layers, while 55.1% of females did the same procedure by the placement of four to five layers. For the length

of treatment time, 19.3% of males spent more than 30 minutes on the procedure, while 41.8 % of females fit in the same category. For the most challenging point in class 2 resin composite restoration, there was no difference between males and females ( $p > 0.05$ ). Adequate proximal contact was chosen most frequently, followed by moisture control and margin contouring. The technical variables indicating gender difference remained significant in the multiple logistic regression analysis, implying that this gender difference can not be completely explained by the confounding effects of age, practice type, practice location, practice size, and specialty training. The multivariate associations between operative techniques and gender are listed in Table 4. Female dentists were 1.87 times more likely than males to per-

**Table 2.** Comparison of operative techniques between male and female dentists in class 2 composite restoration

Operative techniques	Males n (%)	Females n (%)	p-value
Use of a rubber dam			
Always	71 (11.1)	26 (15.4)	0.4098
Frequently	89 (13.9)	21 (12.4)	
Sometimes	188 (29.4)	52 (30.8)	
Do not use dam	292 (45.6)	70 (41.4)	
Preferred types of matrix			
Celluloid strip	341 (53.8)	87 (51.8)	0.2451
Metal matrix	209 (33.0)	62 (36.9)	
Other types of matrix	71 (11.1)	19 (11.3)	
Do not use matrix	13 (2.1)	0 (0.0)	
How many increments for build-up?			
Less than two to three increments	333 (52.0)	63 (37.7)	0.0046
Four to five increments	272 (42.4)	92 (55.1)	
More than six increments	36 (5.6)	12 (7.2)	
Length of operation time			
< 15 min	114 (17.9)	11 (6.7)	< 0.0001
15-30 min	401 (62.8)	85 (51.5)	
30-45 min	112 (17.6)	62 (37.6)	
> 45 min	11 (1.7)	7 (4.2)	
The most difficult part in restoration			
Appropriate proximal contact	376 (58.2)	91 (53.5)	0.0685
Moisture control	137 (21.2)	44 (25.8)	
Appropriate margin contouring	75 (11.6)	29 (17.1)	
Postoperative hypersensitivity	36 (5.6)	3 (1.8)	
Shaping of occlusal profile	14 (2.2)	2 (1.2)	
Others	8 (1.2)	1 (0.6)	

form multiple incremental filling (4 layers or more) under adjustment for other related factors. Additionally, female dentists were 2.72 times more likely than males to spend 30 minutes or more on the treatment procedure.

### 3. Operative techniques in class 5 composite restoration

For the case of a noncarious cervical lesion presented with a clinical photo (Figure 1), 34.8 % of male dentists replied that they would not use a base or liner, while only 18.5% of females gave the same answer (Table 3). Flowable resin was most frequently chosen as the base material, followed by resin-modified glass ionomer (RMGI). We found that 21.1% of male dentists performed multiple incremental filling (four to five layers or more), while 30.4% of

female dentists used the same technique. Additionally, 21.6% of male dentists spent more than 20 minutes on the restoration, while 31% of female dentists spent the same length of time. The primary postoperative complication of class 5 resin composite restoration was debonding for both male and female dentists, followed by postoperative sensitivity. This clinical outcome was not different between both groups ( $p > 0.05$ ). Multiple logistic regression analysis exhibited the gender difference in operative procedures after adjustment for other related factors (Table 4). Female dentists were 2.69 times more likely than their male counterparts to use a cavity base or liner. And female dentists were also 1.83 times more likely than male dentists to do multiple incremental filling (4 layers or more) and 1.63 times more likely to spend 20 minutes or more per procedure.

**Table 3.** Comparison of operative techniques between male and female dentists in class 5 composite restoration

Operative techniques	Males n (%)	Females n (%)	p-value
Use of liner or base			
No liner/base	220 (34.8)	31 (18.5)	< 0.0001
Flowable resin	219 (34.7)	74 (44.0)	
Resin-modified glass ionomer	163 (25.8)	57 (33.9)	
Others	30 (4.7)	6 (3.6)	
How many increments for build-up?			
Bulk filling	69 (10.7)	7 (4.1)	0.0031
Two to three increments	447 (69.2)	111 (64.9)	
Four to five increments	120 (18.6)	49 (28.7)	
More than six increments	10 (1.5)	4 (2.3)	
Length of operation time			
< 10 min	140 (21.7)	28 (16.4)	0.0416
10-20min	366 (56.7)	91 (53.2)	
20-30min	119 (18.4)	41 (24.0)	
> 30 min	20 (3.2)	11 (6.4)	
Most frequent postoperative complication			
Debonding	234 (36.2)	62 (36.0)	0.9148
Postoperative hypersensitivity	227 (35.1)	58 (33.7)	
Mismatch of shade	40 (6.2)	15 (8.7)	
Appropriate margin contouring	76 (11.7)	19 (11.1)	
Discoloration	57 (8.8)	15 (8.7)	
Others	13 (2.0)	3 (1.8)	

**Table 4.** Association of gender and operative techniques in class 2 and class 5 composite restorations after adjustment for other related factors

Operative techniques	Females vs. males	
	Odds ratio* (95% CI)	p-value
Class 2 restoration		
Increments of four times or more	1.87 (1.24-2.71)	0.0009
Time expenditure of 30 min or longer	2.72 (1.82-4.06)	< 0.0001
Class 5 restoration		
Use of liner/base	2.69 (1.71-4.25)	< 0.0001
Increments of four times or more	1.83 (1.21-2.76)	0.0042
Time expenditure of 20 min or longer	1.63 (1.07-2.43)	0.0232

\* Adjusted for age, practice type, practice location, practice size, and specialty training.

#### IV. Discussion

This study was based on the data acquired by a nationwide survey to investigate gender differences in operative dentistry with a specific focus on direct resin composite restoration. The survey was conducted using an electronically delivered questionnaire. The subject line of the e-mail was "A survey on esthetic bonded restoration," and the e-mail asked for participation in the linked survey. After reading a brief introduction on the survey, the recipients were able to click the icon labeled "Participation" and then proceed to the questionnaire. An electronically delivered survey has the advantages of a rapid response rate, improved ease of data collection and minimal cost when compared to traditional paper surveys sent via mail.<sup>17)</sup> However, the major drawback of an electronically delivered survey is the low response rates, which is partially due to incorrect, inactive or non-existent e-mail addresses. In our study, information was received from 840 respondents, representing 71.4% of those who clicked to participate in the survey, 31.9% of those who viewed the e-mail, but only 6.9% of the total number of dentists who were sent the e-mail. There were a large proportion of true non-respondents who have actually received the e-mail but deleted it without opening it or chose not to participate in the survey. Previous studies on the effect of the non-response group noted that low response rates to health studies do not necessarily result in a high non-response bias.<sup>18,19)</sup> In this study,

more dentists in the younger age group were included in the respondent group. Additionally, more female dentists belonged to the younger age group. However, the age and gender distributions were not significantly different between the respondents and the overall Korean dentist population ( $p > 0.05$ ). The vast majority of dentists were in private practice (female, 80.2%; male, 76.2%). Relatively more female respondents (53.7%) than male respondents (29.2%) were working in a large practice which had seven employees or more. In our questionnaire, the ownership of a practice was not determined; however, it may be related to that female dentists were less likely than male dentists to own the practice as shown in other studies.<sup>6-8)</sup> Instead, female dentists were more likely to be employed in a large practice with several dental staff. Relatively more female dentists were currently finishing or had completed a specialty program in conservative dentistry. This fact reflected the current trend in Korea of a growing enrollment by female graduates in the specialty of conservative dentistry.

For class 2 resin composite restoration, we chose a distoocclusal cavity of an upper second premolar for the exemplary case, which may not be an esthetically critical area. Considering that the primary selection of material would not be direct resin composite for some respondents, we posed the question: "If you were to restore the distoocclusal cavity of the upper second premolar with resin composite, how often would you use a rubber dam?" There was no signifi-

cant difference between male and female dentists in the frequency of rubber dam usage: 15.4% of female and 11.1% of male dentists always used a rubber dam, while more than 40% of both groups did not use a rubber dam in such a case. However, field isolation still seemed to be a concern, since moisture control was chosen as the most challenging part of the procedure by many respondents (females, 25.9%; males, 21.2%). Proximal contact formation was the most frequently chosen answer by both groups. A clear plastic matrix was the more preferred matrix type compared to a metal matrix; but a question concerning how to place the strip was not included in the questionnaire.

It is well known that polymerization shrinkage stress of resin composite is influenced by the configuration factor of a cavity, and incremental build up has been broadly recommended in resin composite restoration.<sup>20)</sup> Additionally, incremental layering can increase the polymerization degree of the resin composite placed in a deep cavity preparation. Generally, it is recommended that the resin composite should be cured in increments no greater than 2 mm in thickness.<sup>21)</sup> However, cavity filling in very small increments may not be desirable due to increased chair time and inclusion of porosity between the layers. It is interesting to note that female dentists tend to split the layers into smaller increments in both class 2 and class 5 restorations. Female dentists were also more likely than male dentists to take a longer time for the restoration procedure. Furthermore, this gender-specific operative pattern was clearly reflected in base or liner applications of class 5 restorations. 44.0% and 33.9% of female dentists would use flowable resin and RMGI, respectively, for the base or liner of a moderately deep V-shaped non carious lesion given as an example (Figure 1), while 34.7% and 25.8% of males gave the same answers, respectively. Flowable resin can provide a stress-relief function to compensate for polymerization shrinkage stress of the overlying resin composite and improve internal adaptation by wetting the cavity wall.<sup>22)</sup> However, the elastic bonding capacity of flowable resin was shown to be offset by its inherently high shrinkage rate.<sup>23,24)</sup> Resin-modified glass ionomer cement may be another option for a lining material

with a preferable dentin bonding capacity. However, no clarified consensus exists on the efficacy of base or liner application prior to resin composite restoration, since many conflicting results have been induced from *in vitro* and *in vivo* experiments with regards to postoperative sensitivity, microleakage, bonding durability, etc.<sup>25-28)</sup> Therefore, a practitioner's inclination to use a base or liner may be related not only to evidence-based knowledge but also individual preference. Only a few studies have been performed on gender differences in dental procedures, but their findings were that operative procedures reflected gender-specific patterns. In a survey of Canadian dentists, women were more likely than men to practice recommended infection control procedures, such as wearing gloves, a mask, and protective eyewear, and being vaccinated against the hepatitis B virus.<sup>29)</sup> In a Swedish report, female dentists reported that 0.8 more of their weekly working hours were used for prosthodontic treatment compared to their male counterparts.<sup>4)</sup>

In spite of the dissimilarity in operative techniques between male and female dentists, postoperative sensitivity and debonding were chosen as the major concerns after class 5 resin composite restorations for both groups. There are several procedural steps related to postoperative complications and bonding failure such as cavity preparation, dentin and enamel bonding, resin composite placement, polymerizing light irradiation, etc. For the bonding procedure, it would be even more complicated to select clinically specific variables because of the diversity of adhesive agents and their usage.<sup>15)</sup> It is the same with the irradiating source, since various light-curing units require different irradiation times and intensities. However, more extended questions on other parts of operative procedure will derive additional valuable information on the association of gender and dental practice. Also, unbiased, well stratified sampling methods are crucial in a surveyed study, which were not properly applied in this study. Despite the limitations of this study, a gender difference was identified in several aspects of operative procedures involved in direct resin composite restoration. Future study covering other areas of dental practice will help identify the inherent characteristics of male and

female clinical performance.

## V. Conclusions

This study revealed differences between male and female practitioners regarding operative procedures of direct resin composite restoration. Female dentists were more likely than males to use a base or liner prior to resin composite placement, to apply resin composite in smaller increments, and to spend a longer time for the restoration procedure.

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국문초록

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본 연구에서는 복합 레진을 이용한 2급/5급 와동의 직접수복에 있어서 치과의사의 성별에 따른 술식의 차이를 비교하였다. 2008년 대한치과의사협회에 등록된 치과의사 12,193명을 대상으로 이 메일을 통한 설문조사를 실시하였다. 이 메일 수신이 확인된 2,632명 중 840명이 응답하였으며 응답자의 남녀 비율은(남 78.9%, 여 21.1%) 전체 치과의사의 남녀 비율과 유의한 차이를 보이지 않았다( $p > 0.05$ ). Chi-square test 와 multiple logistic regression analysis 를 이용하여 남녀간 술식의 차이를 검증하였다. 2급 와동 수복에서 여자치과의사는 4회 이상의 적층 분할 수복을 하는 경향이 남자치과의사에 비해 1.87배 높았으며, 술식 당 30분 이상 소요하는 경향은 2.72배 높았다( $p < 0.05$ ). 5급 와동 수복에서 여자치과의사는 베이스를 사용하는 경향이 1.83배 높았으며, 술식 당 20분 이상 소요하는 경향은 1.63배 높았다( $p < 0.05$ ). 본 설문조사에 따르면 남녀 성별에 따라 복합 레진 수복 술식의 차이가 존재하는 것으로 나타났다.

**주요단어:** 설문조사, 성별, 수복 술식, 남녀 치과의사, 복합 레진 수복