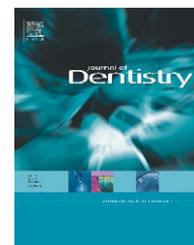


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## Sex differences in denture satisfaction

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### ABSTRACT

**Objectives:** Males and females differ in their responses to many health conditions and treatments. The aim of this randomized clinical trial was to determine whether there are differences in the way that male and female edentulous elders rate their satisfaction with new mandibular implant overdentures (IODs) and conventional dentures (CDs), at 6 and 12 months following delivery.

**Methods:** Edentulous elders ( $n = 256$ ) were randomly assigned to receive maxillary conventional dentures and either mandibular overdentures supported by two implants with ball attachments or conventional dentures. Participants rated their general satisfaction, as well as other features of their dentures (comfort, stability, ability to chew, aesthetics, etc.) prior to treatment and 6 and 12 months after delivery.

**Results:** Ratings of satisfaction with IODs were significantly higher than with CDs. Six months after delivery, females in the CD group rated their general satisfaction and satisfaction with ability to chew and aesthetics significantly lower than did the males. The sex differences in the CD group remained at 12 months after delivery. However, males and females in the IOD group rated their general satisfaction and all six subcategories equally.

**Conclusions:** Elderly females are less satisfied with conventional dentures than elderly males with regards to aesthetics and ability to chew, but equally satisfied with implant overdentures. At 6 and 12 months after delivery, elderly edentulous males and females wearing mandibular implant overdentures were significantly more satisfied than those wearing conventional dentures.

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## 1. Introduction

The absence of all natural teeth has a negative impact on mastication, speech, aesthetics and overall oral health-related

quality of life. The prevalence of edentulism in elders is reported to range from 25% to 30% in North America<sup>1,2</sup> and from 15% to 72% in Europe.<sup>3</sup> Even though the prevalence of edentulism is declining, the older population (65 and older) is

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expected to increase over the next two decades.<sup>2,4</sup> Edentulous elders will be older and more physically challenged with an increased need for oral health care.

Mandibular 2-implant overdentures have been shown to be superior to conventional dentures in both randomized and nonrandomized clinical trials. Elders are significantly more satisfied with 2-implant overdentures than with new conventional dentures, and their oral health-related quality of life is better. There is now overwhelming evidence that mandibular 2-implant overdentures should become the first-choice treatment for edentulous patients.<sup>5-8</sup>

Sex differences have been shown in many studies on oral health. In many countries, more females than males are edentulous. This male-female difference may reflect a higher proportion of older females in a population.<sup>2</sup> It was also reported that males are less concerned about their edentulism, less likely to opt for restorations and less likely to visit a dentist than females.<sup>9</sup> Furthermore, there are reports that the prevalence of denture stomatitis is also greater in female denture-wearers<sup>10</sup>.

Therefore, we wished to determine whether there are differences in the way that females and males respond to the treatment for edentulism.

Accordingly, in this study we assessed the association between ratings of general satisfaction and sex in an edentulous population. The null hypothesis was that there is no difference in ratings of satisfaction by males and females who received mandibular implant overdentures (IODs) and conventional dentures (CDs) at 6 and 12 months after denture delivery.

## 2. Materials and methods

One hundred and forty-two females and 114 males were recruited to participate in a randomized-controlled clinical trial (RCT). The recruiting process was previously reported.<sup>11</sup> In general, advertisements for subjects willing to participate in a clinical trial of mandibular conventional dentures or 2-implant overdentures were placed in local French and English newspapers, as well as in a monthly periodical for retired people. Respondents who met the requirement of telephone screening ( $n = 730$ ) were invited to an information session, in which the research assistant explained all aspects of the treatment and the study. Those who were interested in participating were then given a clinical examination to confirm that they had adequate bone for two implants to be placed in the anterior mandible. People meeting the inclusion criteria (Table 1) were then individually asked if they wished to participate and, if so, were invited to sign and confirm informed consent. The study and the consent form were approved by the McGill University Institutional Review Board. Treatment was randomly assigned using an offsite data management company, and patients were stratified by sex and the presence of type II diabetes to reduce potential selection bias.

Patients were treated either with maxillary conventional dentures and mandibular overdentures supported by two implants with ball attachments or with maxillary and mandibular conventional dentures. Standard surgical and prosthodontic procedures were followed, as in previous RCTs undertaken by this research group.<sup>7,8</sup>

**Table 1 – Inclusion and exclusion criteria**

<b>Inclusion criteria</b>
Male and female
Age 65 years and older
Being edentulous for a minimum of 5 years
Wishing to replace existing conventional dentures
An adequate understanding of written and spoken English or French
Able to understand and respond to the questionnaires used in the study
Willing and able to accept the protocol and to give informed consent
<b>Exclusion criteria</b>
Insufficient bone to place two implants in the anterior mandible
Other oral conditions that preclude immediate prosthetic treatment
Acute or chronic symptoms of temporomandibular disorders
History of radiation therapy to the orofacial region
Systemic or neurologic disease that contraindicate implant surgery
Any neoplasia diagnosed less than 5 years previously
A BMI less than 20 kg/m <sup>2</sup> or more than 32 kg/m <sup>2</sup>
Score of 24 or less on the mini-mental state evaluation (to eliminate subjects with impaired cognitive function)
Presently taking any of the following which will affect blood nutrient concentrations: dietary supplements, anti-neoplastic medication, phenytoin or corticosteroids
Other health conditions that jeopardize surgical treatment (alcoholism, etc.)
Psychological or psychiatric conditions that could influence diet and reaction to treatment

Prior to the provision of treatment and at 6 and 12 months after delivery of the prostheses, each subject rated a series of satisfaction measures using the McGill Denture Satisfaction Instrument. Briefly, for each of the satisfaction outcomes, patients were asked to mark on 100-mm visual analogue scale (VAS), their satisfaction with their mandibular prostheses (from completely dissatisfied to completely satisfied), for general satisfaction, comfort, aesthetics, stability and ability to chew, as well as ease of cleaning and speaking.<sup>12</sup>

The primary outcome for this RCT was designed to evaluate the nutritional state of the patients in the different treatment groups at 6 and 12 months post-delivery. In this report, we present findings on the secondary outcome, treatment satisfaction. It was estimated that 30 edentulous subjects per treatment group would provide 80% power with a type I error of 0.05, for a clinical meaningful difference of 20 mm in general satisfaction measured on a 100-mm VAS and variance (25)<sup>2,7</sup>. With over 100 edentulous participants in each treatment group, this study is sufficiently powered to assess ratings of satisfaction according to the treatment received.

Independent sample t-tests were used to examine group differences by sex. All tests were considered significant at  $P < 0.05$ . Bonferroni's method was used to control for family wise type I error. Each individual test was considered significant if  $P < 0.05/\text{number of comparisons}$ . As such, the overall probability of type I error for each test was 0.05. In addition to independent t-tests, multiple regression analysis was used to explore the relationship between patients' perception of the prostheses, treatment group and sex, adjusting for the effect of other potential confounding variables of age, pretreatment

**Table 2 – Distribution of study subjects in two treatment groups according to sex and age**

Sex	Conventional denture group		Implant overdenture group	
	n (%)	Mean year of age (S.D.)	n (%)	Mean year of age (S.D.)
Male	52 (44.4)	73.3 (4.9)	51 (45.1)	72.3 (4.7)
Female	65(55.6)	71.0 (3.7)	62 (54.9)	72.8 (5.0)

ratings of satisfaction. In addition, to assess if treatment effect was different for males than females, an interaction term of sex and treatment type was added to the multivariate regression model. All statistical analyses were conducted using SPSS statistical software version 14.0.

### 3. Results

#### 3.1. Demographics

A total of 256 participants, males ( $n = 114$ ) and females ( $n = 142$ ) consented to take part in the study, with 128 assigned to the implant overdenture group and 128 assigned to the conventional denture group. The two groups were well matched on potential confounding factors. After randomization, 26 withdrew, 15 from the IOD group and 11 from the CD group. The reasons for the withdrawal included fear of implant surgery ( $n = 9$ ), cancer ( $n = 5$ ), were unhappy with their new prostheses ( $n = 4$ , all from the CD group), unable to contact ( $n = 4$ ), decided that treatment was unnecessary ( $n = 1$ ) and no reason ( $n = 3$ ). The sex distribution of the study subjects in the IOD and CD groups is shown in Table 2.

The overall mean age of the study population was  $72.3 \pm 4.6$  years. They were edentulous for a mean of  $32.6 \pm 15.6$  years, and the mean number of previous prostheses made was  $3.7 \pm 2.3$ . The mean age of their dentures at baseline was  $9.6 \pm 7.2$  years. Seventy-five percent were very dissatisfied (general denture satisfaction lower than 50/100 on VAS) with their lower dentures at baseline.

#### 3.2. Treatment comparisons

Comparisons of post-treatment satisfaction ratings between the IOD and CD groups demonstrated significant between-treatment differences. At both the 6- and 12-month follow-up visits after denture delivery, the IOD group rated general satisfaction, as well as comfort, stability, ability to chew and aesthetics, significantly higher than the CD group ( $P < 0.01$ , t-test) (Table 3). Six months after delivery of the prostheses, a significant difference between the IOD and CD group for ability to speak ( $P < 0.01$ ) was found, but this difference was not observed at 12 months (Table 3). In the subcategory of chewing ability, participants in the IOD group reported that it was easier to chew food of different hardnesses and texture than did those in the CD group (bread, cheese, carrot, dry salami, steak, apple and lettuce;  $P < 0.05$ , t-test). With a Bonferroni correction, the significance remained for all foods (cheese, carrot, dry salami, steak, apple and lettuce) except soft bread. These differences were found at both 6 and 12 months post-delivery (Table 3).

Both groups demonstrated significant improvements between baseline and 6 and 12 months post-delivery ( $P < 0.001$ ,

paired t-test). Furthermore, no significant differences were detected for either group when comparing ratings at 6 and 12 months post-treatment ( $P > 0.05$ , paired t-test).

#### 3.3. Sex comparisons

##### 3.3.1. t-Test

At baseline, females rated their ability to chew, aesthetics and ability to speak significantly lower than the males ( $P < 0.05$ ). At 6 months post-denture delivery, females in the CD group gave lower ratings for ability to chew, aesthetics, general satisfaction, comfort and stability than the males (Table 4). However, in the IOD group, males and females rated their general satisfaction and all six subcategories equally. At 12 months after denture delivery, females and males in the IOD group still rated their denture satisfaction equally. However females in the CD group still rated ability to chew and aesthetics significantly lower than the males (Table 4).

##### 3.3.2. Bonferroni adjustment

After Bonferroni adjustment, ability to chew and aesthetics were the only two factors in which sex differences at 6 months were detected for the conventional denture group. At 12 months, sex differences were evident for aesthetics only (Table 4).

**Table 3 – Six- and 12-month post-treatment mean difference and 95% confidence interval (CI) of patients' ratings of denture satisfaction between IOD and CD treatment groups<sup>a</sup>**

Variable	Between group differences <sup>b</sup> at 6 months		Between group differences <sup>b</sup> at 12 months	
	Mean	95% CI	Mean	95% CI
General satisfaction	22 ***	15–29	16 ***	9–23
Comfort	22 ***	15–29	16 ***	8–23
Stability	18 ***	11–25	15 ***	7–22
Ability to speak	9 **	3–14	3	–2 to 8
Ability to clean	1	–4 to 5	–1	–5 to 3
Aesthetics	8 *	2–14	8 **	3–14
General ability to chew	19 ***	13–26	12 ***	6–19
Bread	11 **	5–18	6 *	0.4–12
Cheese	17 ***	11–24	11 ***	5–17
Carrot	31 ***	23–40	21 ***	13–30
Salami	27 ***	19–35	19 ***	11–28
Steak	27 ***	20–35	15 ***	7–22
Apple	30 ***	22–37	16 ***	9–24
Lettuce	20 ***	13–27	12 ***	5–18

<sup>a</sup> \* $P < 0.05$ ; \*\* $P \leq 0.01$ ; \*\*\* $P \leq 0.001$ .

<sup>b</sup> Based on independent t-test.

<sup>c</sup> Positive values indicate higher satisfaction in the implant overdenture group.

**Table 4 – Mean differences and 95% confidence interval (CI) between females' and males' satisfaction scores at 6 and 12 months post-treatment according to treatment received<sup>a</sup>**

Variable	Between gender differences at 6 months						Between gender differences at 12 months					
	Conventional group (n: 65 (F), 52 (M)) <sup>b</sup>			Implant group (n: 62 (F), 51 (M)) <sup>b</sup>			Conventional group (n: 58 (F), 48 (M)) <sup>b</sup>			Implant group (n: 56 (F), 51 (M)) <sup>b</sup>		
	Mean	95% CI	P-value	Mean	95% CI	P-value	Mean	95% CI	P-value	Mean	95% CI	P-value
General satisfaction	13	0.4–25	0.043	5	–1 to 11	0.095	8	–5 to 20	0.239	–2	–9 to 6	0.634
Comfort	15	3–28	0.016	1	–4 to 7	0.636	4	–8 to 17	0.488	–1	–10 to 7	0.760
Stability	12	0.1–25	0.048	0	–8 to 7	0.939	12	–1 to 24	0.062	–3	–12 to 5	0.459
Ability to speak	8	0–17	0.071	3	–2 to 8	0.300	5	–3 to 12	0.198	–3	–10 to 4	0.379
Ease of clean	4	–3 to 11	0.210	4	–2 to 10	0.213	1	–5 to 7	0.816	1	–5 to 8	0.676
Aesthetics	13	4–23	0.006 <sup>c</sup>	2	–3 to 7	0.446	13	4–22	0.005 <sup>c</sup>	3	–3 to 9	0.334
Ability to chew	16	5–27	0.005 <sup>c</sup>	1	–5 to 6	0.862	12	2–23	0.024	–1	–8 to 5	0.632

<sup>a</sup> Based on independent t-test.

<sup>b</sup> Positive values indicate higher satisfaction in the male group.

<sup>c</sup>  $P < 0.05$  (Bonferroni  $P < 0.007$ ).

### 3.4. Final model

A multivariate linear regression analysis model was used to show the relationship between participants' ratings at 6 and 12 months after delivery and type of treatment, adjusted for sex,

pretreatment ratings and interaction between sex and type of prosthesis (Tables 5a and 5b). Results confirm that at 6 months after delivery, those wearing implant overdentures rated all aspects significantly higher than those wearing conventional dentures ( $P < 0.01$ ), except for ease of cleaning. These

**Table 5a – Linear regression analysis for relationship between patients' ratings of denture satisfaction at 6 months after delivery and type of treatment adjusted for sex, pretreatment variables and sex/type of prostheses interaction**

Patients ratings	Variable	Coefficient	P-value	95% CI for coefficient
General satisfaction	Type of prostheses <sup>a</sup>	24.8	<0.001	15.5–34.0
	Sex <sup>b</sup>	11.7	0.019	1.9–21.4
	Sex/type of prostheses interaction	–6.4	0.368	–20.2 to 7.5
	General satisfaction at baseline	0.130	0.036	0.009–0.252
Ability to chew	Type of prostheses	25.5	<0.001	16.8–34.2
	Sex	14.5	0.002	5.3–23.7
	Sex/type of prostheses interaction	–14.4	0.031	–27.4 to –1.4
	Ability to chew at baseline	0.118	0.033	0.009–0.227
Comfort	Type of prostheses	27.5	<0.001	18.2–36.8
	Sex	14.4	0.004	4.8–24.1
	Sex/type of prostheses interaction	–12.8	0.069	–26.6 to 1.27
	Comfort at baseline	0.133	0.019	0.022–0.244
Stability	Type of prostheses	22.5	<0.001	12.8–32.1
	Sex	10.8	0.037	0.7–21.0
	Sex/type of prostheses interaction	–10.0	0.178	–24.5 to 4.6
	Stability at baseline	0.174	0.007	0.048–0.301
Ability to speak	Type of prostheses	9.4	0.010	2.3–16.5
	Sex	6.4	0.091	–1.0 to 13.9
	Sex/type of prostheses interaction	–4.9	0.361	–15.5 to 5.7
	Ability to speak at baseline	0.163	<0.001	0.075–0.251
Aesthetic	Type of prostheses	11.8	0.002	4.4–19.2
	Sex	11.5	0.004	3.8–19.2
	Sex/type of prostheses interaction	–11.1	0.048	–22.0 to –0.1
	Aesthetic at baseline	0.189	<0.001	0.103–0.275
Ease of clean	Type of prostheses	0.5	0.865	–5.5 to 6.5
	Sex	4.3	0.181	–2.0 to 10.6
	Sex/type of prostheses interaction	–0.8	0.869	–9.8 to 8.2
	Ease of clean at baseline	0.111	0.034	0.008–0.213

<sup>a</sup> 0, CD; 1, IOD.

<sup>b</sup> 0, female; 1, male.

**Table 5b – Linear regression analysis for relationship between patients' ratings of denture satisfaction at 12 months after delivery and type of treatment adjusted for sex and pretreatment variables and sex/type of prostheses interaction**

Patients ratings	Variable	Coefficient	P-value	95% CI for coefficient
General satisfaction	Type of prostheses <sup>a</sup>	19.5	<0.001	9.7–29.2
	Sex <sup>b</sup>	5.8	0.260	–4.4 to 16.0
	Sex/type of prostheses interaction	–6.9	0.344	–21.3 to 7.5
	General satisfaction at baseline	0.215	0.001	0.089–0.340
Ability to chew	Type of prostheses	17.0	<0.001	8.7–25.4
	Sex	9.5	0.034	0.7–18.2
	Sex/type of prostheses interaction	–11.4	0.067	–23.6 to 0.8
	Ability to chew at baseline	0.181	<0.001	0.078–0.284
Comfort	Type of prostheses	17.4	0.001	7.1–27.7
	Sex	3.5	0.525	–7.3 to 14.2
	Sex/type of prostheses interaction	–4.4	0.572	–19.6 to 10.8
	Comfort at baseline	0.162	0.009	0.041 to 0.283
Stability	Type of prostheses	19.7	<0.001	9.8–29.6
	Sex	9.6	0.069	–0.8 to 20.0
	Sex/type of prostheses interaction	–10.7	0.150	–25.3 to 3.9
	Stability at baseline	0.248	<0.001	0.123–0.374
Ability to speak	Type of prostheses	5.4	0.119	–1.4 to 12.1
	Sex	3.3	0.356	–3.8 to 10.4
	Sex/type of prostheses interaction	–7.4	0.144	–17.3 to 2.5
	Ability to speak at baseline	0.172	<0.001	0.088–0.256
Aesthetic	Type of prostheses	11.1	0.003	4.0–18.3
	Sex	10.3	0.007	2.8–17.8
	Sex/type of prostheses interaction	–8.9	0.094	–19.4 to 1.5
	Aesthetic at baseline	0.197	<0.001	0.114–0.280
Ease of clean	Type of prostheses	–1.4	0.631	–7.2 to 4.4
	Sex	0.692	0.821	–5.3 to 6.7
	Sex/type of prostheses interaction	0.4	0.925	–8.1 to 8.9
	Ease of clean at baseline	0.162	0.001	0.067–0.256

<sup>a</sup> 0, CD; 1, IOD.  
<sup>b</sup> 0, female; 1, male.

differences did not change at the 12-month appointment, except that the difference found for the ability to speak was no longer significant ( $P = 0.12$ ).

Significant between-sex differences in ratings of satisfaction were detected. Females gave lower ratings for general satisfaction, ability to chew, comfort, aesthetics, and stability at 6 months after denture delivery. At 6 months post-treatment, the interaction between sex and treatment contributed significantly to the model, indicating that, although there is no sex difference in ratings of chewing ability or aesthetics with implant overdentures, males report higher ratings of chewing ability and more satisfaction with the appearance of conventional dentures than females. At 12 months, this association was reduced to a strong tendency ( $P = 0.067$ ) regarding chewing ability (Tables 5a and 5b).

## 4. Discussion

### 4.1. Sex differences—conventional dentures

Sex differences in perception and evaluation of symptoms has been previously studied.<sup>13</sup> It has been suggested that females report pain symptoms more willingly than males, and that they recall health problems to a greater extent than males do.<sup>14</sup>

This study revealed that there are, in fact, differences between males' and females' ratings of their mandibular conventional dentures. Six months after delivery, females rated their overall satisfaction lower than males, particularly for the ability to chew and aesthetics. At the 12-month follow-up, the differences in ratings of aesthetics between the sexes remained.

There are few reports of sex differences in studies investigating oral prostheses. In one study, the effect of oral prostheses on the quality of life of head and neck cancer patients was investigated. It was reported that in both a cancer group wearing maxillofacial prostheses, as well as in a control group wearing conventional dentures, females rated most variables lower than the males.<sup>15</sup> However, the authors failed to find significant differences, most probably because the sample size was small. In another study, it was found that males could adapt more easily to new removable partial dentures than females. The need for "three and more visits for adjustment after delivery" was found to be significantly more common among females than males.<sup>16</sup>

What may cause these differences in ratings by females and males? They may be explained by either physical or psychological differences between the sexes. It has been suggested that variety of factors may contribute, including hormonal alterations,<sup>17</sup> blood pressure<sup>18</sup> and psychological

factors.<sup>19</sup> Furthermore, sex role expectancies and anxiety may moderate sex differences.<sup>19</sup> To date, there is little evidence to indicate how much, if any, of these variables may contribute to these differences between the sexes.

#### 4.1.1. Chewing ability

In human health care research, differences between the sexes have been found in many fields. Females are usually more sensitive to innocuous stimuli than males. In a study investigating the tactile detection threshold (TDT), it was shown that females had a significantly lower TDT on the skin of cheek than males.<sup>20</sup> The author failed to find significant difference intra-orally on the maxillary gingiva and the anterior tip of the tongue. Other authors have reported that the peak perioral sensitivity of females was significantly greater than the peak sensitivity of males.<sup>21</sup> Another study showed that females were more spatially sensitive than males, especially at the perioral region. The investigators reported that females have a greater ability to discern subtle changes in lip, cheek and chin position than males.<sup>22</sup> These findings may begin to explain why there are differences in ratings of ability to chew, but not in comfort between females and males in the conventional group. Unstable conventional dentures may move or rotate slightly during chewing function, even though these small movements and pressure changes may not cause pain. However, females may perceive these stimuli more than males, thus resulting in their lower ratings in chewing ability. Equally, it may simply just concern them more than it did males.

After the extraction of teeth, residual ridge resorption in the alveolar portion of the jaw begins. Compared with males, elderly females are at a higher risk of severe resorption in the edentulous mandible than males.<sup>23</sup> The bone mineral content in edentulous females' mandible also decreases with aging, while that of males' increases slightly. Osteoporosis may be regarded as a cofactor of residual ridge resorption in women.<sup>24</sup> Therefore, it could be suggested that these physical differences are a factor in the sex differences in ratings of CDs. We have tested this hypothesis and were unable to find supporting evidence (Pan et al., in preparation).

#### 4.1.2. Aesthetics

Females rate aesthetics lower than males. This may be due to the low stability of mandibular conventional denture. It is more likely that CDs will move or even come out of the mouth during functions like eating and speaking. A qualitative study showed that most of the strategies used by CD wearers to eat and control their dentures are embarrassing to some individuals and lead to social constraints, such as avoiding eating in public. Embarrassment may be due to fear that other people would recognize that they have dentures.<sup>25</sup> For these reasons, CD wearers may put more effort in concealing their dentures from others by talking less, eating more slowly and smiling, instead of laughing, in public places. Therefore, the sex differences in ratings of aesthetics with the CDs may actually be reasonable if females associate aesthetics with not only the way the denture looks in the mouth but also with their perioral appearance when they are wearing a CD.

There are also psychological differences between sexes. Tooth loss impairs speech, aesthetics, mastication, and deglu-

tion, which are important components of survival and social interaction.<sup>26</sup> Aesthetically, the mouth is a prime area of focus in social and sexual communications, reflecting an individual's identity and self-image.<sup>27</sup> Investigators have reported on clinical evidence of body image disturbance in edentulous denture-wearers.<sup>28,29</sup> They found that sex was associated with satisfaction for 14 of the 27 body cathexis scales, including profile and overall facial attractiveness. A higher proportion of males expressed satisfaction with the 14 items. Females are less satisfied with their bodies.<sup>28</sup> Males showed less dissatisfaction with dental appearance, even when their aesthetic appearance was rated worse by dental professionals.<sup>29</sup> Previous articles also support this argument.<sup>29,30</sup> This difference in perception of appearance between sexes might also contribute to the sex differences in ratings of satisfaction with aesthetics.

Furthermore, psychological differences between the sexes may also come from sex-specific preferences and coping strategies. Studies of ischemic heart disease and cardiac rehabilitation show that females report greater psychological distress and lower self-efficacy, self-esteem and quality of life at the time of a first cardiac event or the beginning of rehabilitation.<sup>31</sup> Differences between the sexes were found in other rehabilitation processes. This situation may be the same when females are undergoing oral rehabilitation. Being female was also shown to be an unfavorable prognostic factor in rehabilitation following stroke.<sup>32</sup>

This evidence supports the finding in our study on differences between the sexes in their satisfaction of their conventional dentures.

## 4.2. Sex differences—implant overdentures

Although females were less satisfied with their new CDs than were the males, these differences were not apparent in ratings of the IODs. However, there was significant interaction between sex and type of prosthesis for ability to chew and aesthetics. This means that females rated the IODs significantly greater than they had rated the CDs for these factors. The greater satisfaction with IODs was strong enough to buffer the effect of sex and eliminate the differences between females and males, thus providing both sexes with equally high satisfaction.

#### 4.2.1. Chewing ability

It is easy to understand why sex differences in chewing ability were not apparent in the implant overdenture group. With implant overdentures, denture stability increased significantly. The movement and pressure changes in the chewing process that may be unpleasant for females wearing conventional dentures do not occur to the same extent with implant overdentures. Therefore, the ratings of ability to chew were equal between the sexes when mandibular implant overdentures are worn.

#### 4.2.2. Aesthetics

It seemed confusing that females would rate aesthetics lower than males for CDs, but not for IODs if aesthetics were viewed in a "static" sense. If the wearer perceives that the denture moves in function, then she may also feel that this will be perceived by those around her, and thus may view this in

terms of aesthetics. Certainly, it has been shown that women are more concerned about their appearance than men.<sup>28,29</sup> Even though the CDs and IODs look very similar, when retained by two implants, IODs become more stable than CDs. Therefore, people do not need to make an effort to keep the lower implant overdenture in place or to try to conceal its movements.<sup>28</sup> The increased retention and stability of the IODs is likely to be the reason why no sex differences in ratings of aesthetics were found.

In summary, we found that elderly females were less satisfied with their conventional dentures than males, but equally satisfied with their implant overdentures.

## 5. Conclusions

These findings suggest that while both edentulous males and females appear to be more satisfied with implant overdentures than with conventional dentures, females may be less satisfied with conventional dentures than males. Clinicians may wish to consider this when advising their elderly edentulous patients in choice of treatment.

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