

# 유방절제환자를 위한 보정용 브래지어와 부속물 착용실험연구(III)\*

## A Study on Wearing Tests of Mastectomy Brassieres with Prostheses

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### <Abstract>

본 연구의 목적은 유방절제수술을 받은 여성들을 위해 개발한 다섯 종류의 브래지어와 두 종류의 보정물 유형에 따른 착용감과 쾌적성을 검토하기 위한 것이다. 피험자로는 유방절제시술기간이 3년 이상이며 브래지어 사이즈 85에 컵사이즈 A컵인 여성 세 명을 선정하였다. 실험방법은 보정물을 삽입한 브래지어를 하루에 최소 15시간 이상 연속착용하도록 하고 실험복을 착용한 상태에서 피험자들의 일상과 그에 소요된 시간을 기록하도록 하였으며 이 때 착용한 브래지어와 보정물에 대한 느낌을 5점 척도로 표시하게 하였다. 실험기간은 다섯 종류의 브래지어를 하루에 한 가지씩 정해진 순서대로, 처음 5일은 육보정물과 함께 착용하도록 하고 그 후 5일은 스펀지 보정물과 함께 착용하도록 하였으며 이러한 순서를 두 번 반복하게 하여 총 20일이 소요되었다. 각각의 피험자들에 대해서는 실험이 진행되는 동안 반복적인 면접을 통하여 진행상황을 기록하였으며 아울러 실험복에 대한 제언을 수렴하여 보다 나은 제품개발을 위한 기본 자료화 하였다. 실험결과는 다음과 같다.

1. 브래지어에 있어서는 세 명의 피험자가 일치된 결과를 나타내어 일반적인 브래지어 형태와 가장 유사하면서 어깨 끈과 하변밴드 폭만 약간 넓혀준 실험복이 착용감에서 가장 높은 점수를 받았다. 착용자의 편의를 고려하여 앞트임으로 제작한 실험복의 경우에는 앞으로 구부렸을 때 밴드부분이 꺾이는 현상이 생겼으며 피험자들이 모두 뒤트임에 익숙하여 앞트임 브래지어 착용에 불편함을 나타내었다. 브

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래지어 착용평가에 있어서는 피험자들의 일상적인 행동이나 보정물의 종류가 영향을 미치지 않는 것으로 나타났다.

2. 보정물평가에 있어서는 모든 피험자가 옥가루 재질의 보정물만으로는 수술부위를 자극하는 느낌이 든다고 하였으나 3mm 두께의 스펀지와 함께 삽입했을 때는 아무런 문제가 없는 것으로 나타났다. 또한 보정물의 무게 조절이 가능하므로 실리콘재질의 보정물에서 쉽게 찾아볼 수 있는 무게에 대한 문제를 제기한 피험자는 없었다. 그러나 스펀지로 제작된 보정물에 대해서는 무게가 너무 가벼워 모든 피험자들이 양 쪽 가슴의 균형이 잘 맞지 않는다고 답하였으며 특히, 운동을 즐기고 활동이 많은 피험자의 경우 스펀지로 제작된 보정물에 대해 큰 불만을 표시하였다.

**주제어(Key Words):** 유방암 환자용 브래지어(mastectomy brassiere), 인조유방(breast prosthesis), 착용 실험(wearing test), 유방암(breast cancer)

## I. Introduction

People who feel confident about their looks tend to get on with their lives easily. In the case of women having experienced breast surgery, they have to adjust to changes in their physical appearance from the loss of a breast. That is to say, they are left with a noticeable difference in breast size, and how to maintain a natural look becomes of major concern. A study reported that breast cancer survivors have severe rehabilitation problems associated with body image, sexual interest, and physical activities in spite of good health status after surgery(Ganz, PA., Coscarelli, A., Fred, C., Kahn, B., Polinsky, M.L., and Petersen, L., 1996). Therefore, selecting a brassiere with a properly fitted prosthesis is very important to attain a balanced and natural chest appearance. It may also help patients to regain their self-esteem.

When a surgeon gives patients permission to wear brassieres, the women often have many questions about how to select a brassiere and prosthesis properly fitted to provide a balanced look. A lot of information about mastectomy brassieres and prostheses can be found on the

internet using a key word search of "prosthesis" or "mastectomy". These products are available in many brands and styles.

A prosthesis is a weighted device that substitutes for a missing breast and is worn inside a brassiere. It is removable and may be of partial or full shaped. While using a prosthesis, patients should wear a special mastectomy brassiere, which contains a pocket to hold the prosthesis. A regular brassiere can also be adapted and a full coverage brassiere is better suited for a seamless look. A brassiere with under wire offers better support, too.

In Korea, however, all mastectomy brassieres and prostheses have been imported in a limited range of sizes and styles, so that the size-related problems have been reported and in addition, the price ranges are considered too high. Therefore, to design our own mastectomy brassieres and prostheses with correct fittings, we developed five styles of mastectomy brassieres and prostheses (H.Choi & K.Lee, 2001). Wearing tests of the sample products were performed to obtain data for the development of improved versions.

## II. Methods

### 1. Subjects

First, six middle-aged women were recruited and the purpose of our experiment was explained to them. We trained them for three hours and two of them gave up saying the procedure was too complex to perform. Finally, three volunteers participated in the wearing test. All of them had had a modified radical mastectomy three or more years ago. The data of the subjects including simple anthropometric measurements are shown in <Table 1>. Chest circumference and under bust circumference data were not included because the subjects did not know their measurements: they had never measured their chest sizes since the mastectomy. They had been choosing a brassiere and prosthesis based on the brassiere sizes that they had worn before the operation. All of them had been using a mastectomy brassiere and prosthesis of silicone manufactured in Germany.

### 2. Designs of sample products

As shown in <Table 2>, five styles of brassiere and two types of prostheses were employed. We developed five different brassiere styles and a jade powder-filled prosthesis(H. Choi et al, 2001) and added a lightweight padded prosthesis to this test

to compare the difference with the weighted prosthesis. Another variation to the test was the addition of a 3mm sponge layer of the same size and shape as each of the test brassiere cups. It was worn together with the #1 prosthesis to supplement the hard feeling from the jade powder. The shapes of the two prostheses were made exactly the same to find out how prostheses weight affects the wearing comfort.








The materials used to make the top cups of all the brassieres consisted of 75% nylon with 25% polyurethane mixed and the bottom cups were 65% polyester with 33% cotton mixed. While nylon and polyester fabric were generally used for the imported mastectomy brassieres, we chose the cotton mixed fabric for the bottom cups to supplement the absorbency and increase the comfort to the skin.

In the brassiere style selection, we added a front closure of four snap buttons, the same as ones used at the crotch of body suits. This was recommended by the product maker because it does not irritate the skin and is easier to use than the other types like hook and eye, or zippers. In Japan and USA, various types of back and front closures have been experimented with and this is why we put in the front closure style. The style #301 was especially selected because we thought it would prevent brassieres from riding up by using a wide underband(40mm) and also help to attain a slimmer

<Table 1> data of subjects

subject no.	age	height (cm)	weight (kg)	brassiere size	missing breast side	job	year of operations
1	43	165	65	85A	right	merchant	1998
2	53	160	68	85A	right	housewife	1987
3	58	163	62	85A	right	medical doctor	1985

<Table 2> descriptions of developed brassieres and prostheses

brassiere style #	design	features and size	materials used
101		<ul style="list-style-type: none"> <li>• 40mm wide under-band</li> <li>• adjustable 18mm shoulder strap</li> <li>• back closure</li> <li>• size 85A</li> </ul>	
102		<ul style="list-style-type: none"> <li>• elastic sections</li> <li>• 40mm wide under-band</li> <li>• convenient front snap closure</li> <li>• size 85A</li> </ul>	<ul style="list-style-type: none"> <li>• top cups</li> <li>- nylon/ polyurethane</li> <li>• bottom cups</li> </ul>
201		<ul style="list-style-type: none"> <li>• 20mm wide under-band</li> <li>• non-wire type</li> <li>• back closure</li> <li>• size 85A</li> </ul>	<ul style="list-style-type: none"> <li>- polyester/ cotton</li> <li>- polyurethane</li> </ul>
202		<ul style="list-style-type: none"> <li>• 20mm wide under-band</li> <li>• convenient front snap closure</li> <li>• size 85A</li> </ul>	
301		<ul style="list-style-type: none"> <li>• separated center panel</li> <li>• 40mm wide under-band</li> <li>• back closure</li> <li>• size 85A</li> </ul>	
prosthesis #	design	features	materials used
1		<ul style="list-style-type: none"> <li>• one envelope and four pillow weight form (weight-changeable)</li> <li>- total weight 400g</li> <li>• envelope size ; 10*14*5 (L*W*H/cm)</li> </ul>	<ul style="list-style-type: none"> <li>• nylon / cotton</li> <li>• jade powder</li> </ul>
2		<ul style="list-style-type: none"> <li>• same shape as #1 prosthesis</li> <li>• lightweight padding (80g)</li> <li>• 10*14*5 (L*W*H/cm)</li> </ul>	<ul style="list-style-type: none"> <li>• nylon / cotton</li> <li>• sponge</li> </ul>

look. All of the subjects were middle aged women who had gained weight and experienced somatotype changes due to the aging process, so we adapted some features of the special brassiere for the body-contour correction.

### 3. Test Procedure

Three subjects were instructed to wear a brassiere with a prosthesis for over 15 hours a day and follow all their usual daily routines including working out, jogging, housecleaning, cooking, etc. They wore every brassiere from brassiere style #101 to #301 in order with prosthesis #1 for five days and repeated the same sequences with prosthesis #2. These entire sequences were carried out twice: in total, the tests were performed for 20 days. We did not change the wearing order through the whole test procedure because we wanted to compare the wearing convenience between front and back closures from the same kind of brassieres such as #101 with #102 and #201 with #202. We should have chosen the reversed order from #202 to #101 for the repeated sessions, but the number of the subjects were small and the test days were not too long, so that we decided to repeat the same sequences.

The subjects were instructed to record every activity with the time they spent on it and record their assessments and comments about wearing the brassiere with the prosthesis. They were also asked to indicated their reasons when dissatisfied. After that, they rated their degree of satisfaction on a 5-point scale, ranging from 1(very unsatisfactory) to 5(very satisfactory). Two categories of sample products were evaluated at the same time: brassiere and prosthesis.

We were unable to perform the sensory test because all the subjects showed a very frustrated reaction and refused to comply. In addition, statistic methods were not applied because we could not recruit a sufficient number of volunteer subjects.

### III. Results

#### 1. Brassieres satisfaction

All of the subjects had different jobs and had followed their usual routines for 20 days. We did not limit the range of motions because we wanted to get data on natural everyday routine activities. Among them, subject #3 was the most outgoing and performed the most various activities. She made it a rule to go to the gym every day and enjoyed swimming, too. The others had their own social routines too like attending meetings, volunteering, etc. According to their everyday reports, however, the activity they were engaged in didn't influence their rating of the appearance of each brassiere type. Moreover, the type of prosthesis did not affect the rating of the brassieres, either.

The overall satisfaction score with the fit of each type of brassiere did not reveal a big variation (Table 4, 5) and the responses from the three subjects were the same on the whole. All the subjects reported that brassiere style #201 was the most comfortable. It was similar to the ordinary brassiere style with a slightly wider under-band (20mm) to prevent the brassiere from riding up and also featuring adjustable shoulder straps (18mm). They were especially satisfied with the width of the shoulder straps that allowed for increased comfort when wearing the brassiere for a long time.

The brassiere style #301 was evaluated as the most uncomfortable one. This style was designed for additional support and full coverage, making the portion under the brassiere cup wider. As a result, it was the widest (including the 40mm

under-band) among the five brassiere styles. However, it caused unexpected binding problems and the separated center piece did not give a good separation between the unaffected part of the breast and the prosthesis, either. This may have been due to the brassiere size. Although the cup size of all the brassiere style was A, the brassiere size was 85 and our brassiere cup size produced a relatively bigger than usual A cup because we took into consideration convenience in inserting the prosthesis as well as the volume of the prosthesis.

In addition, the subjects pointed out that the brassieres with front closure #s102 and 202 did not fit comfortably: they commented there were too many snap buttons and the wide under-band tended to bind when leaning forward because of the metal buttons' stiffness. They also reported preferring the back closure since they were used to it.

Also, they preferred the 20mm under-band to the 40mm one because it was considered to give better support than an ordinary brassiere without binding. Furthermore, a 40mm under-band caused a binding problem especially in the case of the front closure style.

#### 2. prostheses satisfaction

Each prostheses was worn in brassiere style #s101 to 301 in order and each subjects repeated the procedure for 20 days. While the various activities of the three subjects did not affect the appearance of the brassieres in the wearing tests, there were big differences between the two types of test prostheses and each subject recorded a slightly different problem depending on the range of their activities.

The most common complaint among the

&lt;Table 3&gt; satisfaction with 5 brassiere styles(1)

(%)

questionnaire brassiere scale #	easy to insert or pull out the prosthesis					the closure doesn't irritate skin in wearing					shoulder straps don't droop					the straps don't dig into the shoulders				
	101	102	201	202	301	101	102	201	202	301	101	102	201	202	301	101	102	201	202	301
very unsatisfactory	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	12 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
unsatisfactory	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (100)	12 (100)	0 (0)	12 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
neutral	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	12 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
satisfactory	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
very satisfactory	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)	0 (0)	0 (0)	12 (100)	0 (0)	0 (0)	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)
tot.	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)	12 (100)

&lt;Table 4&gt; satisfaction with 5 brassiere styles(2)

(%)

questionnaire brassiere scale #	the brassiere doesn't ride up					the band doesn't dig in					the brassiere fits good				
	101	102	201	202	301	101	102	201	202	301	101	102	201	202	301
very unsatisfactory	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	2(17)	0(0)	4(34)	10(83)	0(0)	12(100)	0(0)	12(100)	12(100)
unsatisfactory	0(0)	0(0)	0(0)	0(0)	0(0)	2(17)	10(83)	0(0)	8(66)	2(17)	0(0)	0(0)	0(0)	0(0)	0(0)
neutral	0(0)	0(0)	0(0)	0(0)	0(0)	8(66)	0(0)	0(0)	0(0)	0(0)	10(83)	0(0)	10(83)	0(0)	0(0)
satisfactory	0(0)	0(0)	0(0)	0(0)	0(0)	2(17)	0(0)	0(0)	0(0)	0(0)	2(17)	0(0)	2(17)	0(0)	0(0)
very satisfactory	12(100)	12(100)	12(100)	12(100)	12(100)	0(0)	0(0)	12(100)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)
tot.	12(100)	12(100)	12(100)	12(100)	12(100)	12(100)	12(100)	12(100)	12(100)	12(100)	12(100)	12(100)	12(100)	12(100)	12(100)

subjects was the sensation caused by the #1 type of prostheses. They complained it tended to irritate the chest area and it felt too hard when they were wearing it without the 3mm sponge layer. It may be advisable to use the thin padded layer of the envelope's outer shell, so that the weighted pillows inserted in the brassiere pocket would not touch the chest directly. Moreover, all the subjects had been using the soft silicone prosthesis for a long time period and a mere 20-days wearing test would be too short of a time period to get used to a

much harder prosthesis. When they were wearing the #1 prosthesis with the 3mm sponge layer, however, they reported a fair level of comfort.

None of the subjects complained of a weight problem from the #1 prosthesis. In a previous survey of wearers of a silicone prosthesis(K.Lee & H.Choi, 2000), most subjects reported a problem with the weight of the device. Since only imported products were available and the size ranges were limited both in the selection of the mastectomy brassiere and prosthesis, they had to select a

&lt;Table 5&gt; satisfaction with 2 types of prostheses(1)

(%)

questionnaire scale prosthesis #	a prosthesis gives cramped feeling when wearing a prosthesis for a long time		where a prosthesis is inserted causes any kind of skin irritation		a prosthesis does not stay in place when doing various activities	
	1	2	1	2	1	2
quite disagreed	5(17)	2(7)	22(73)	30(100)	24(80)	16(53)
disagreed	17(56)	7(23)	8(27)	0(0)	6(20)	8(27)
neutral	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)
agreed	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)
quite agreed	8(27)	21(70)	0(0)	0(0)	0(0)	6(20)
tot.	30(100)	30(100)	30(100)	30(100)	30(100)	30(100)

&lt;Table 6&gt; satisfaction with 2 types of prostheses(2)

(%)

questionnaire scale prosthesis #	weight of a prosthesis gives pressure to shoulder and chest		a prosthesis is too light for the natural breast to keep posture balance		a prosthesis prevents the air circulation and makes a wearer feel hot	
	1	2	1	2	1	2
quite disagreed	26(87)	30(100)	30(100)	0(0)	15(50)	3(10)
disagreed	0(0)	0(0)	0(0)	0(0)	15(50)	3(10)
neutral	4(13)	0(0)	0(0)	0(0)	0(0)	0(0)
agreed	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)
quite agreed	0(0)	0(0)	0(0)	30(100)	0(0)	24(80)
tot.	30(100)	30(100)	30(100)	30(100)	30(100)	30(100)

&lt;Table 7&gt; satisfaction with 2 types of prostheses(3)

(%)

questionnaire scale prosthesis #	a prosthesis gets to be damp when a wearer sweats		a prosthesis does not match the brassiere size		a prosthesis does not recreate natural balance	
	1	2	1	2	1	2
quite disagreed	15(50)	0(0)	0(0)	22(73)	0(0)	20(67)
disagreed	15(50)	6(20)	7(23)	8(27)	5(17)	10(33)
neutral	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)
agreed	0(0)	0(0)	7(23)	0(0)	8(27)	0(0)
quite agreed	0(0)	24(80)	16(54)	0(0)	17(56)	0(0)
tot.	30(100)	30(100)	30(100)	30(100)	30(100)	30(100)

silicone prosthesis according to the brassiere size(based on the size difference between the chest circumference and the under bust circumference), not according to the breast volume. However,

breast volume differs greatly even when women wear the same brassiere size(K. Lee, 2000). Our product was revised to adapt to the weight of the normal breast and it was considered to be

successful.

On the other hand, #2 prosthesis was found to be too light, so that all the subjects experienced a posture balance problem. Also, this light prosthesis did not stay in place and so the subjects reported nervousness when going out. In the case of subject #3, she voiced particular complaint because she spent considerable time working out every day. She also pointed out that both prostheses made her feel hot due to insufficient air circulation leading to poor absorption of sweat and a consequent damp sensation after workout.

From the perspective of recreating natural appearance, all the subjects reported that #2 prosthesis did not work. Subjects #2 and #3 reported the same opinion about #1 prosthesis while subject #1 were satisfied with #1 prosthesis on the whole.

#### **IV. Conclusions and Discussions**

The starting premise of the study was that the number of women diagnosed with breast cancer has been increasing enormously every year and a significant consequent problem was that no manufacturers in Korea were producing their own mastectomy brassieres and prostheses. A few companies just imported a limited selection of products from western countries or Japan. Consequently, it was natural that the patients had so many problems in getting information and selecting products with appropriate fit.

We admitted our brassieres did not match the precise cup size with the prostheses, because the selected manufacture had never produced

mastectomy brassiere before. Our subjects, however, commented that our brassiere, #201 and the weight-changeable prosthesis would be more comfortable than the imported products as well as more acceptable pricewise, if a few things were improved.

In developing the prosthesis, the price and the appearance were the most important factors we considered. The movement and feel of a natural breast are the predominant advantages of the silicone prosthesis and it is very difficult to elicit these qualities from other materials: not too heavy and not too light. Accordingly, we developed the weight-changeable prosthesis. It consisted of four pillows each of a different weight. Generally, the cup size is not consistent with the brassiere size based on the difference between chest circumference and under bust circumference even if women wear the same brassiere size. For example, for the brassiere size 85, the real cup size would be related to the chest obesity, so that the prosthesis development should not only be focused on the cup size but also on the breast volume. To settle size specification for mastectomy brassieres and prostheses, more study about the measurement of breast volume is needed.

We hope that more underwear companies will become interested in breast cancer patients' rehabilitation and manufacture improved products through the repetition of wearing tests like ours. We would also like to see hospitals more interested in following up on their breast cancer patients after mastectomy. The hospitals should support them with more than just medical advice. Hospitals have to try to help the patients adapt themselves back to normal social lives after undergoing mastectomy. We were limited in our number of subjects and the



use of the brassiere size 85 with prosthesis, so that the test procedure and the test jobs were also limited. However, the generally positive assessment from the subjects encouraged us to hope to develop better products. We aim to utilize the advice from the patients, underwear companies, and medical doctors to improve the shortcomings pointed out by the subjects. We hope to develop various outwear and leisurewear garments to give mastectomy patients a better fit and outer appearance in the near future.

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