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Comparison of complication according  
to incision types in  
nipple-sparing mastectomy  
and immediate reconstruction

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Directed by Professor Joon Jeong

The Master's Thesis  
submitted to the Department of Medicine,  
the Graduate School of Yonsei University  
in partial fulfillment of the requirements for the degree  
of Master of Medicine

Soeun Park

June 2019

This certifies that the Master's Thesis of  
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## ABSTRACT

### **Comparison of complication according to incision types in nipple-sparing mastectomy and immediate reconstruction**

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**Background:** Nipple-sparing mastectomy (NSM), followed by immediate breast reconstruction (IR), has become a preferable surgical procedure with good results in cosmesis and patient satisfaction. However, nipple-areolar complex (NAC) ischemia and necrosis remain major problem after NSM and IR.

**Methods:** We retrospectively analyzed patients who received NSM and immediate reconstruction in Gangnam Severance Hospital from Jan 2009 to Jun 2018. We compared patient characteristics and complication rate among three different incisions (inframammary fold, radial, periareolar). Additionally, we identified risk factors of NAC necrosis.

**Results:** The data from eligible 290 breasts of 275 patients were analyzed. Patients with inframammary fold (IMF) incision had relatively smaller breast weight. Overall complication rate was highest with periareolar incision and lowest with IMF incision (42.6% vs 18.8%,  $p < 0.001$ ). Rate of NAC ischemia or necrosis was significantly different among three incisions (9.7%, 17.0%, 31.1% in IMF, radial, and periareolar, respectively,  $p < 0.001$ ). In addition, surgical treatments were more

frequently needed in patients with periareolar incision. Neoadjuvant chemotherapy, distance from tumor to nipple base, periareolar incision, breast weight and large implant volume were related to NAC necrosis in univariable analysis. Periareolar incision, shorter distance from tumor to nipple base and large breast weight remained as significant risk factor in multivariable analysis.

Conclusions: Compared to IMF incision, periareolar incision was associated with higher incidence of surgical complications and NAC necrosis. IMF incision could be a superior choice to improve aesthetic outcome and reduce surgical complications for nipple-sparing mastectomy.

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Key words : nipple-sparing mastectomy, nipple-areolar complex necrosis, complication, incision

# **Comparison of complication according to incision types in nipple-sparing mastectomy and immediate reconstruction**

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## **I. INTRODUCTION**

Nipple-sparing mastectomy (NSM) is a surgical technique that preserves patient's own breast skin and nipple-areolar complex (NAC), with removing the glandular and ductal tissue<sup>1,2</sup>. NSM followed by immediate reconstruction (IR) has gained popularity due to its superior outcomes in cosmesis and patient satisfaction<sup>1,3,4</sup>. Because the procedure has been proven as safe as conventional mastectomy in oncologic aspect, the number of NSM cases as therapeutic and prophylactic mastectomy have increased annually<sup>2,5-15</sup>.

In contrast to acceptable overall complication rate compared to skin sparing mastectomy or modified radical mastectomy, skin (including NAC) necrosis was significantly higher in NSM based on meta-analysis study using Cochrane database<sup>15</sup>. During the surgery, glandular and ductal tissue is maximally resected in order to reduce the chance of loco-regional recurrence<sup>16</sup>, which can injure the blood supply of breast skin and NAC<sup>17,18</sup>.

NAC necrosis is regarded as the most problematic complication of NSM causing unpleasant result such as deformity of nipple, hypopigmentation in NAC area, or loss of NAC. The rate of NAC ischemia or necrosis after NSM is ranging from 0% to 48%, showing large variation according to studies<sup>2,5,8,19-22</sup>. However, meta-analysis study analyzing recent studies revealed an overall partial NAC necrosis

rate of 4.62% and complete NAC necrosis rated of 2.49%, which is acceptably low<sup>22</sup>. Among the risk factors of NAC necrosis, type of surgical incision has been identified in several studies with the highest necrosis rate in periareolar incision<sup>8,19,22-26</sup>.

In this study, we compared complications of NSM followed by IR in three incision types from the database of our center. Also, we analyzed patient, tumor characteristics and surgical factors in multivariable analysis to investigate risk factors of NAC necrosis.

## II. MATERIALS AND METHODS

### 1. Demographics

We retrospectively reviewed the electronic medical records of patients who underwent NSM followed by immediate reconstruction in Gangnam Severance Hospital from January 2009 to June 2018. NSM was mostly performed as treatment for invasive breast cancer not expected to have invasion in NAC. Other indication included mastectomy for phyllodes tumor or prophylaxis. Patient and tumor characteristics (age, body mass index (BMI), history of diabetes mellitus (DM), hypertension (HTN), smoking, neoadjuvant chemotherapy, previous radiotherapy or surgery on ipsilateral breast, side (left/right), nearest distance from nipple base to tumor (TND), and breast weight), as well as surgical factors including oncologic surgeon, incision type, type of axillary surgery and reconstruction methods were investigated. TND was estimated based on MRI and patients with neoadjuvant chemotherapy were excluded for analysis. Patients who had received prior breast augmentation were also excluded.

The protocol of study was approved by the institutional review board (IRB) review of the Gangnam Severance Hospital. The need for informed consent was waived under the approval of the IRB due to retrospective design.

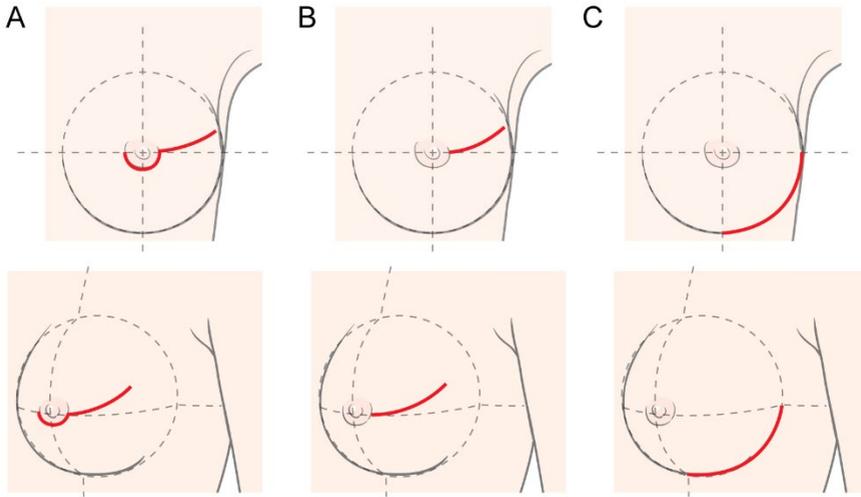
## 2. Surgical procedure

We performed NSM using three types of incision – radial, periareolar and inframammary fold (IMF) incisions (Figure 1). Radial incision starts at lateral side of NAC, extending to axilla obliquely. This incision could be abutting to areola, but did not include the border of areola. Periareolar incision was similar to radial incision, but included part of the border of either upper or lower side of areola, which is usually determined according to tumor location. Lastly, IMF incision was made along patient's natural skin crease of inframammary fold. When an ipsilateral breast area was regarded as a circle, about a quarter in lower outer circle line was included for incision. Thus, IMF incision did not include NAC.

Skin flap was made along superficial mammary fascia, with thickness of approximately 7-15mm. In case of cancer surgery, subareolar margin was sent for frozen biopsy and examined intraoperatively by pathologist. When cancer invasion was found in subareolar margin, NAC was resected. Sentinel lymph node biopsy or axillary lymph node dissection was performed according to the patient's node status.

After mastectomy, immediate breast reconstruction was performed by plastic surgeons in our institution. In prosthetic-based (direct-to-implant (DTI) or tissue-expander) reconstruction, all devices were inserted in the subpectoral plane and covered with allogenic dermal matrix sling. Tissue-expander was prefilled up to about one-third of specimen volume to reduce skin tension. In case of autologous breast reconstruction, deep inferior epigastric artery perforator (DIEP) free flap reconstruction or latissimus dorsi (LD) myocutaneous island flap reconstruction was performed. Jackson-Pratt drains were inserted during surgery, and removed when the amount of daily drainage became less than 30cc. Second-generation cephalosporins were administered at anesthesia induction and continued until drains were removed. For those who underwent reconstruction with DIEP free flap, intravenous prostaglandin E2 was given until postoperative day 7. For those who underwent implant-based reconstruction (tissue-expander or direct-to-implant), aminoglycoside antibiotics were additionally administered with second-generation

antibiotics.



**Figure 1. Incisions of nipple-sparing mastectomy**

(A: periareolar, B: radial, C: IMF)

### 3. Complications

In order to evaluate the complications related to incision types, we included early phase of post-operative complications until six months after surgery. Complication events were inspected by plastic surgeons and reported in electronic medical record during admission and outpatient visits. We analyzed complications in six categories; infection, skin necrosis, nipple necrosis, implant removal, others, and surgical treatment.

Postoperative infection was defined as any of the following; i) when escalation or continuation of antibiotics was needed for clinical infection signs, ii) when pathogenic bacteria cultured from wound site was confirmed. Skin or NAC necrosis included partial or complete necrosis, which was spontaneously healed after conservative cares or required surgical treatment, respectively. Other

complications included hematoma, dehiscence or minor wound problems. Surgical treatment was defined as operative procedure required to resolve complications at the breast site unrelated to autologous flap.

#### 4. Statistical analysis

The data were analyzed using SPSS ver. 23.0 (IBM Co., Armonk, NY, USA). Chi-square test or ANOVA was used to compare patients' characteristics. Chi-squared test was also used to compare the rates of complications among the incisions. We performed binary logistic regression analysis to examine the adjusted odds ratios of nipple necrosis for each risk factor. The factors which showed statistical significance (P-values < 0.1) in the univariable analysis were used in the multivariable analysis. P-values < 0.05 were considered to indicate statistical significance.

### III. RESULTS

#### 1. Demographics

A total of 275 patients underwent nipple-sparing mastectomy with immediate reconstruction for 290 breasts. 283 breasts underwent mastectomy for breast cancer or in situ carcinoma, while two underwent mastectomy for phyllodes tumor. Five were prophylactic mastectomies.

Characteristics of the patients were described in Table 1. The patients' mean age was 46.5 ( $\pm 7.9$ ), ranging from 23 to 72, and mean BMI was 22.4 (range 13.8 - 35.0). Nineteen (6.6%) patients and six (2.1%) patients had HTN and DM history, respectively and five (1.7%) patients had smoking history. Forty-nine (16.9%) patients had previous chemotherapy history, and among them 34 (11.7%) patients received neoadjuvant chemotherapy before NSM. Forty-eight (16.6%) patients underwent previous surgical treatment on the affected breast, which included

excisional biopsy or partial mastectomy, and 21 (7.2%) patients underwent radiotherapy.

**Table 1. Demographics of overall patients**

Age, yr (Mean)		46.5 ( $\pm$ 7.9)
BMI (Mean)		22.40 ( $\pm$ 2.95)
HTN		19 (6.6%)
DM		6 (2.1%)
Smoking		5 (1.7%)
Neoadjuvant CTx		34 (11.7%)
Pre RTx Hx		21 (7.2%)
Pre Surgery Hx		48 (16.6%)
Site		
	Right	147 (50.7%)
	Left	143 (49.3%)
TND, cm		2.81 ( $\pm$ 1.61)
Breast weight, g		387.22 ( $\pm$ 178.80)
Axillary surgery		
	Not done	13 (4.5%)
	SLNB	208 (71.7%)
	ALND	69 (23.8%)
Surgeon		
	1	235 (81.0%)
	2	52 (17.9%)
	Others	3 (1.0%)
Reconstruction		
	DTI	258 (89.0%)
	Tissue-expander	19 (6.6%)
	Autologous	13 (4.5%)

(CTx: chemotherapy, Pre: previous, RTx: radiotherapy, Hx: history, TND: tumor-nipple distance, SLNB: sentinel lymph node biopsy, ALND: axillary lymph node dissection, DTI: direct-to-implant)

Mean TND on MRI was 2.81cm, with nearest distance of 0.5cm. Sentinel lymph node biopsy was performed in 208 (71.7%) and axillary lymph node dissection in 69 (23.8%) patients. 258 (89.0%), 19 (6.6%), and 13 (4.5%) patients underwent immediate reconstruction using DTI, tissue-expander and autologous flap, respectively.

## 2. Characteristics according to incision types

Patient characteristics compared according to incisions are presented in Table 2. The BMI was higher in patients with radial incision (23.2 versus 22.4 (IMF) and 21.7 (periareolar),  $p = 0.037$ ). The patients with IMF incision had relatively lighter breast weight than other patients (352.7g vs 438.9g (radial) and 444.7 (periareolar),  $p < 0.001$ ). Accordingly, DTI volume was also smaller in patients with IMF incision (210.6cc versus 234.1cc (radial) and 260.3 (periareolar),  $p < 0.001$ ). Breast reconstruction using autologous flap was mostly performed in patients with periareolar incision. More patients of IMF incision had prior chemotherapy, but difference was not statistically significant ( $p = 0.051$ ). The other factors were similar between incision groups.

## 3. Complication rate according to incision types

Among 290 breasts, 78 (26.9%) experienced at least one complication (Table 3). Infection occurred in 13 cases (4.5%), skin necrosis in 25 cases (8.6%), nipple necrosis in 45 cases (15.5%), others in 15 cases (5.2%) and surgical treatment in 78 cases (26.9%). The total complication rate was high, followed by periareolar, radial and IMF cases (42.6% vs 35.8% vs 18.8%,  $p < 0.001$ ). Nipple necrosis rate was also highest in periareolar cases, followed by radial and IMF cases (31.1% vs 17.0% vs 9.7%,  $p < 0.001$ ). Similarly, the rate of cases requiring surgical treatment was also the highest in periareolar, followed by radial and IMF incisions (31.7% vs 26.0% vs 14.1%).

**Table 2. Characteristics according to incision types**

	IMF n=176	Radial n=53	Periareolar n=61	P
Age	47.2 (±7.3)	45.8 (±7.9)	45.1 (±9.37)	0.146
BMI	22.4 (±3.1)	23.2 (±2.7)	21.7 (±2.7)	<b>0.037</b>
smoking	4 (2.3%)	0 (0.0%)	1 (1.6%)	0.825*
DM	4 (2.3%)	1 (1.9%)	1 (1.6%)	>0.999*
HTN	8 (4.5%)	5 (9.4%)	6 (9.8%)	0.181*
PreRTx	13 (7.4%)	6 (11.3%)	2 (3.3%)	0.261*
Neoadj. CTx	26 (14.8%)	6 (11.3%)	2 (3.3%)	0.054
Pre Surgery Hx	28 (15.9%)	11 (20.8%)	9 (14.8%)	0.648
TND <sup>†</sup>	2.78 (±1.64)	2.49 (±1.52)	3.12 (±1.59)	0.126
Axillary surgery				0.135
Not done	10 (5.7%)	2 (3.8%)	1 (1.6%)	
SLNB	123 (69.9%)	34 (34.2%)	51 (83.6%)	
ALND	43 (24.4%)	17 (32.1%)	9 (14.8%)	
Breast weight	352.7(±160.6)	438.9(±178.0)	444.7(±206.6)	<b>&lt;0.001</b>
Reconstruction				<b>&lt;0.001*</b>
DTI	164 (93.2%)	48 (90.6%)	46 (75.4%)	
Tissue-expander	12 (6.8%)	4 (7.5%)	3 (4.9%)	
Autologous	0 (0.0%)	1 (1.9%)	12 (19.7%)	
Implant volume <sup>†</sup>	210.6(±69.9)	234.1(±67.3)	260.3(±76.2)	<b>&lt; 0.001</b>

\* Fisher's exact test was used

<sup>†</sup> Missing value

**Table 3. Complication rate according to incision types**

	Total n=290(%)	IMF n=176(%)	Radial n=53(%)	Periareolar n=61(%)	P
<b>Complication</b>	78 (26.9)	33 (18.8)	19 (35.8)	26 (42.6)	<b>&lt;0.001</b>
Infection	13 (4.5)	4 (2.3)	4 (7.5)	5 (8.2)	0.057*
Skin necrosis	25 (8.6)	14 (8.0)	6 (11.3)	5 (8.2)	0.801
Nipple necrosis	45 (15.5)	17 (9.7)	9 (17.0)	19 (31.1)	<b>&lt;0.001</b>
(Complete necrosis)	25 (8.6)	6 (3.4)	6 (11.3)	13 (21.3)	<b>&lt;0.001</b>
Implant removal	11 (3.8)	6 (3.4)	3 (5.7)	2 (3.3)	0.625*
Other	15 (5.2)	7 (4.0)	4 (7.5)	4 (6.6)	0.454*
Surgical treatment	54 (18.6)	22 (14.1)	13 (26.0)	19 (31.7)	<b>0.003</b>

\* Fisher's exact test was used

#### 4. Risk factors of nipple necrosis

As periareolar incision showed significantly higher rates of nipple necrosis, we additionally analyzed the risk factors of nipple necrosis. In univariable analysis (Table 4), reconstruction method, incision types, breast weight and implant volume were risk factors for nipple necrosis. Immediate reconstruction with autologous flap increased the risk 3.733-fold ( $p = 0.027$ ), and periareolar incision increased the risk 4.231-fold ( $p < 0.001$ ). For each increase in breast weight by 1g, risk of NAC necrosis increased 1.003-fold ( $p = 0.004$ ). For each increase in implant volume by 1cc, risk of NAC necrosis increased 1.006-fold ( $p = 0.007$ ).

We included factors having p-value less than 0.1 for multivariable analysis. Hence, neoadjuvant chemotherapy and TND were added as risk factors. We excluded implant volume, because it was related to breast weight and only limited to patients who underwent reconstruction with DTI.

In multivariable analysis (Table 5), periareolar incision, TND and breast weight were found to be risk factors for NAC necrosis. When compared to IMF incision, periareolar incision increased the risk 3.719-fold ( $p = 0.002$ ). Increase in TND by 1cm decreased the risk 0.717-fold ( $p = 0.013$ ). For each increase in breast weight by 1g, risk of NAC necrosis increased 1.002-fold ( $p = 0.015$ ).

## IV. DISCUSSION

In this study, we compared the rate of complications between three types of incisions, and analyzed the factors affecting NAC necrosis. Our results showed that overall complication, nipple-areolar complex necrosis and following surgical treatment were higher in periareolar cases than other incisions. In contrast, infection, skin necrosis or other complications showed no difference according to incisions. Surgical treatments for skin / nipple necrosis, wound dehiscence, or other reasons and implant removal were more frequently needed for patients with periareolar incision. Also, multivariable analysis proved periareolar incision was a

**Table 4. Risk factors of NAC necrosis: Univariable analysis**

Risk factor	OR	95% C.I	P
Age, yr	1.012	0.972-1.053	0.565
BMI	1.045	0.945-1.156	0.392
HTN	1.496	0.473-4.733	0.493
DM	1.091	0.124-9.564	0.937
<b>Neoadj. CTx</b>	0.146	0.019-1.096	<b>0.061</b>
Pre RTx Hx	0.901	0.254-3.194	0.871
Pre surgery Hx	0.744	0.296-1.869	0.529
Site			
Right	Reference		
Left	0.980	0.519-1.851	0.951
<b>TND (cm)</b>	0.814	0.647-1.024	<b>0.079</b>
<b>Reconstruction</b>			
DTI	Reference		<b>0.088</b>
Tissue-expander	1.120	0.311-4.033	0.810
Autologous	3.733	1.158-12.032	<b>0.027</b>
<b>Incision</b>			
Inframammary	Reference		<b>0.001</b>
Radial	1.913	0.798-4.586	0.146
Periareolar	4.231	2.024-8.845	<b>&lt;0.001</b>
<b>Breast weight (g)</b>	1.003	1.001-1.004	<b>0.004</b>
Implant volume <sup>†</sup>	1.006	1.002-1.011	<b>0.007</b>
Initial tissue-expander volume <sup>†</sup>	1.001	0.989-1.013	0.868

<sup>†</sup> Missing value

**Table 5. Risk factors of NAC necrosis: multivariable analysis**

Risk factor	OR	95% C.I	P
Periareolar incision (vs IMF incision)	3.624	1.597-8.239	<b>0.002</b>
TND (cm)	0.713	0.547-0.929	<b>0.012</b>
Breast weight (g)	1.002	1.000-1.004	<b>0.014</b>

risk factor of NAC necrosis.

The inferior outcome of periareolar incision in nipple necrosis has been reported from several studies<sup>8,19,22-26</sup>. Daar et al. performed systematic literature review and meta-analysis on 51 studies with 9975 NSMs, and identified that periareolar incision had the highest NAC necrosis rate (18.10%). On the contrary, IMF incision had comparably low NAC necrosis rate (6.82%)<sup>22</sup>. In our data, similarly, periareolar incision showed higher overall NAC necrosis than IMF incision (31.1% vs 9.7%). The figures are lower for complete nipple necrosis, with a rate of 21.3% in periareolar incision groups and 3.4% in IMF incision groups.

In our study, the other factors that increased the risk of NAC necrosis were short TND and large breast weight. TND has been a main concern for oncologic safety in NSM, and several studies reported feasibility of NSM in patients with short TND<sup>27-30</sup>. However, few papers have investigated the correlation between TND and nipple necrosis. Recently, Ito et al. first reported relationship between TND and nipple necrosis, which showed negative results<sup>31</sup>. In contrast, our study first showed that short TND was significant risk factor for NAC necrosis. We assume that if the tumor is close to the nipple, it is likely that NAC flap will become thinner, which may disrupt the blood supply. Algaithy et al. reported thin areolar flap (< 5mm) as a risk factor for NAC necrosis<sup>19</sup>.

Breast weight or breast volume is a well-known risk factor from previous studies<sup>32,33</sup>. Large breast volume may result in increased skin tension, longer distance from the source of blood supply to nipple, and decreased blood flow to NAC. Also, surgeons could give excessive tension to flap during surgery to acquire sufficient surgical vision.

We analyzed influence of prior treatment including surgery, chemotherapy or radiotherapy on nipple necrosis, and did not find relevance. These factors have been reported heterogeneously in each study. Frey et al. reported that patients with neoadjuvant (with or without adjuvant) chemotherapy were more likely to have implant explantation ( $p = 0.0015$ ) and complete NAC necrosis ( $p = 0.0004$ ) compared to those with no chemotherapy<sup>34</sup>. Conflicting results were reported on the effects of previous radiation therapy<sup>24,35-37</sup>. Prior breast surgery has been

reported to have no effect on NAC necrosis, like our results<sup>38,39</sup>.

There are several limitations in our study regarding its retrospective design. Firstly, there is chronological order in implementing NSM, in order of using periareolar, radial and IMF incision. Hence, improvement of surgical skill and accumulation of experience could affect the surgical outcomes. Secondly, potential bias can exist on choosing incision. Age, breast size, tumor location or previous scar could affect surgeons' choice. Actually, there was tendency of selecting small breasts when early phase of using IMF incision. As a result, IMF incision cases have the smallest mean breast weight. However, as cases increased, this preference has disappeared. Finally, long term outcomes including oncologic safety were not assessed in this study due to short follow up time. Further analysis would be needed.

Nevertheless, our study has some advantages. Because most of our NSM cases have been dominantly performed by one skilled surgeon (81% from Dr. Jeong), the effect of surgical gap among surgeons may be less than other studies. Difference in surgical skill could affect result as reported in Ahn et al.'s study where one particular oncologic surgeon showed much higher rate of NAC ischemia or revisions than others (OR 8.335, 95% CI 1.656-41.962,  $p = 0.0101$ )<sup>26</sup>. Also, we first revealed TND as a risk factor for NAC necrosis through multivariable analysis. As relation between TND and NAC necrosis was analyzed in few studies, this should be considered for future studies.

## V. CONCLUSION

In our retrospective review of 290 NSM cases, we found that periareolar incision has higher incidence of overall complication and risk of NAC necrosis. Inframammary incision could be a preferred choice with superior aesthetic outcome and less complication. There is a need for careful consideration when planning NSM in patients with large breast volume or tumor close to nipple.

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**ABSTRACT (IN KOREAN)****유두 보존 유방절제술 후 즉시 재건 시 절개방법에 따른 합병증 비교**

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박 소 은

연구배경: 유두 보존 유방절제술 후 즉시 재건술은 미용적으로 우수한 결과와 환자의 높은 만족도로 인하여 점점 더 선호되고 있다. 하지만, 수술 이후 유두-유륜 복합체의 허혈 및 괴사는 여전히 주요 문제로 남아있다.

연구방법: 2009년 1월부터 2018년 6월까지 강남세브란스병원에서 유두 보존 유방절제술 후 즉시 재건술을 시행받은 환자를 후향적으로 분석하였다. 환자의 임상 정보와 세가지 절개법 (유방 밑주름 절개, 방사형 절개, 유륜 주위 절개)에 따른 합병증 발생률을 비교하고, 추가적으로 유두-유륜 복합체 괴사의 위험 인자를 평가하였다.

연구결과: 275명의 환자에서 시행된 295건의 자료를 분석하였다. 유방 밑주름 절개를 한 환자들은 상대적으로 유방 무게가 적었다. 전체 합병증 비율은 유륜 주위 절개에서 42.6%로 가장 높았고, 유방 밑주름 절개에서 18.8%로 가장 낮았다 ( $p < 0.001$ ). 유두 유륜 복합체의 허혈 또는 괴사율은 유륜 주위, 방사형, 유방 밑주름 절개 순으로 높았고, 통계적으로 유의한 차이를 보였다 (31.1%, 9.7%, 17.0%). 수술적 치료는 유륜 주위 절개를 시행한 환자에서 가장 많이 시행되었다. 선행항암요법, 종양에서 유두까지의 거리, 유륜 주위 절개, 유방 무게와 유방 보형물 부피는 유두 유륜 복합체의 허혈 또는 괴사를 분석한 단변수 분석에서 연관성을 보였다. 유륜 주위 절개, 가까운 종양에서 유두까지의 거리, 무거운 유방 무게는 다변수 분석에서도 유의미한 위험인자로 평가되었다.

결론: 유방 밀주름 절개와 비교하여, 유륜 주위 절개는 수술 합병증 및 유두-유륜 복합체 괴사의 높은 발생률과 연관이 있었다. 유방 밀주름 절개는 심미적 결과를 개선하고 수술 합병증을 줄이기 위한 탁월한 선택이 될 수 있다.

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핵심되는 말 : 유두 보존 유방절제술, 유두-유륜 복합체 괴사, 합병증, 절개