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Factors determining cosmetic results after periareolar excisional biopsy of benign breast lesions

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【Abstract】 Objective To assess the factors that determine cosmetic results after periareolar excisional biopsy for the management of Breast Imaging- Reporting and Data System (BI-RADS) 3 and 4 breast lesions. **Methods** Potential risk factors for adverse cosmetic results of incision after periareolar excisional biopsy were evaluated in 74 patients (7 people had bilateral breast operations) undergoing a single biopsy after suspicion of a malignant lesion that subsequently proved to be benign. The overall cosmetic result was evaluated using a modification of the European Organisation for Research and Treatment of Cancer (EORTC) cosmetic indices individually scored 6 months after the breast excisional biopsy. To evaluate the factors affecting cosmetic outcome of incision, an analysis of variance was undertaken using the Kruskal-Wallis test for continuous variables and the chi-squared and Fisher exact tests for categorical variables. Based on cosmetic outcome of incision as dependent variables, and patient's age, incision location, scar color respectively as independent variables, multivariate analysis was performed with logistic regression for screening the factors. **Results** Out of 81 operated breasts, the cosmetic result of incision was rated as excellent (0 score) in 19 (23.46%), good (1 score) in 38 (46.91%), fair (2 scores) in 14 (17.28%), and poor (3 scores) in 10 (12.34%). Univariate analysis shows that age, incision location and scar color affected cosmetic result. Older patients, with no scar or white scar, and the inferior or lateral periareolar incision had better cosmetic outcomes of incision. Patients more than 45 years had better cosmetic outcomes of incision than those less than 31 years ($P = 0.0231$). Patients with the inferior or lateral periareolar incision obtained better cosmetic outcomes than those with the superior or medial incision. Patients with no scar obtained better cosmetic outcomes than those with white scar or red scar. **Conclusions** The cosmetic outcomes after periareolar excisional biopsy of benign breast lesions are excellent or good in most of cases. Age, incision location and scar color all affect cosmetic results of incision.

【Key words】 Breast diseases; Biopsy; Cosmetic techniques

In breast surgery, the challenge for good cosmetic needs lies in excisional biopsy for the management of BI-RADS 3 and 4 breast lesions. The biopsy incision is made directly over the lesions likely to create prominent scars. A final periareolar scar is more discreet than a scar from direct incision, with an overall better aesthetic result. There are numerous reports on cosmetic results after breast-conserving surgery^[1], but there are few data concerning cosmetic results after biopsies of benign breast lesions^[2]. We made a prospective study on

the factors determining cosmetic results after periareolar excisional biopsy of breast lesions that subsequently proved benign.

1 Methods

1.1 Patients enrollment

Cosmetic results of 104 consecutive periareolar excisional breast biopsies with subcutaneous tunneling maneuver performed between January 2007 and June 2009 in the Department of Breast Surgery at the First Affiliated Hospital of Harbin Medical University, Harbin, China, were evaluated. In all of these cases, the possibility of malignancy of the breast lesions remained after thorough clinical, mammographic, sonographic examinations. All lesions were Breast Imaging Reporting And Data System (BI-RADS) 3 or 4 breast lesions, requiring an open surgical biopsy.

The patient was operated under general anesthesia. The biopsy was made through a periareolar hemicircular incision. Based on the quadrant location of the tumors, periareolar hemicircular incisions can

DOI:10.3877/cma.j.issn.1674-0807.2013.04.006

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be classified into inferior, medial, superior, and lateral (Figure 1). The aim was to remove the whole lesion with a margin of 0.5–1.0 cm of apparently normal breast tissue along the periareolar incision followed by subcutaneous tunneling maneuver. X-ray control of the specimen was used to ensure adequate excision if necessary. After meticulous hemostasis, the wound was closed with reapproximation of subcutaneous tissue, but without reapproximation of the underlying breast tissue. Skin was closed with a subcutaneous suture using 4/0 reabsorbable Vicryl.

Cosmetic outcomes were evaluated 6 months after operation with a subjective (observer-based) method. All patients signed an informed consent to participate in the study. They were photographed and evaluated. A digital camera with a resolution of at least four megapixels was used to take photographs in four positions: face arms down, face arms up, left side arms up, right side arms up. All ratings were based on a comparison of the treated breast with the untreated breast by a modification of the European Organisation for Research and Treatment of Cancer (EORTC) breast cancer cooperative group protocol 10801 rating of cosmetic results of breast-conserving treatment^[3]. Surgical scars were scored as follows: 0, unobtrusive; 1, visible but not affecting the cosmetic results; 2, visible and detracting somewhat from the cosmetic results; and 3, visible and detracting notably from the cosmetic results. The ratings were classified into 4 descriptive subdivisions: 0, excellent; 1, good; 2, fair; and 3, poor. A five-expert panel evaluated all patients. The evaluation of each case was a prior considered consensual when at least two-thirds of experts provided the same classification of aesthetic result^[4].

The patients with malignant breast lesions confirmed in biopsy ($n=17$) were excluded. Six women were excluded because of refusal, and 7 women never attended the cosmetic follow-up. The remaining 74 patients undergoing breast surgery (7 people had bilateral breast surgery) were included in the

analysis. The patients' mean age was (38.81 ± 10.73) years (range 17–63 years, median 39 years, interquartile range (P_{25} – P_{75}) of 31–45 years).

1.2 Statistical analyses

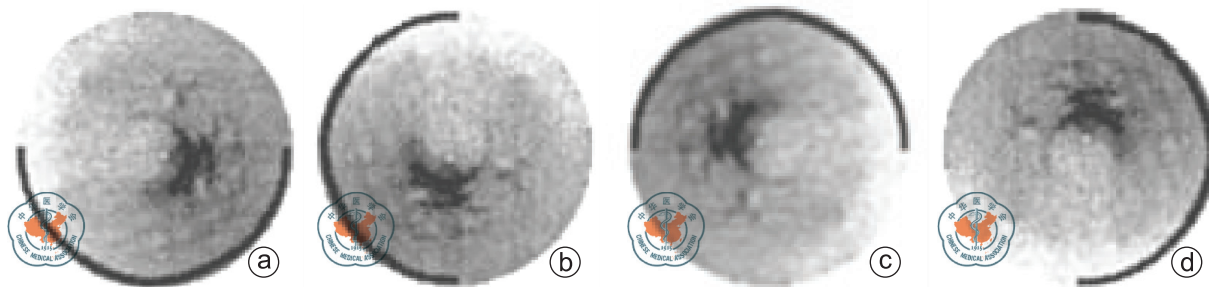
Statistical analyses were carried out with the SAS 9.1 software. Ordinal categorical variables were reported as frequency. Quantitative data were reported as $\bar{x} \pm s$. Mean age of multi-group comparison by ANOVA to meet the homogeneity of variance was applied, using SNK-q (Students-Newman-Keuls) test for pairwise comparisons of mean age of multi-group comparison. To evaluate the factors affecting cosmetic outcome of incision, an analysis of variance was undertaken, using the Kruskal-Wallis test for continuous variables and the chi-squared and Fisher exact tests for categorical variables. To facilitate interpretation of the age, age was divided into 4 sections. Based on cosmetic outcome of incision as dependent variables, and patient's age, incision location, scar color respectively as independent variables, multivariate analysis was performed with logistic regression for screening the factors affecting cosmetic outcome of incision. The specific variable assignment is showed in Table 1. A P value of less than 0.05 was considered as a statistically significant difference.

Table 1 Assignment of the factors affecting cosmetic outcome of incision

Variable	Assignment explanation
Independent variable	
Age (years)	<31 = 1, 31 ~ 38 = 2, 39 ~ 44 = 3, >45 = 4
Incision location	Inferior or lateral = 1, superior or medial = 2
Scar color	No scar = 0, white scar = 1, red scar = 2
Dependent variable	
Cosmetic outcome	0 score = 1, 1 score = 2, 2 score = 3, 3 score = 4

2 Results

Intraoperative and postoperative bleeding was minimal due to the application of electrocautery and well exposure of the surgical field using subcutaneous



a; inferior; b; medial; c; superior; d; lateral

Figure 1 Periareolar hemicircular incisions

tunneling maneuver. No serious color change or slough was observed in the areola. No hematoma formation and infections were encountered.

A total of 81 breasts (7 patients had bilateral operations) were evaluated in 74 patients. The patients' mean age was (38.81 ± 10.73) years (range 17 – 63 years, median age 39 years, interquartile range (P₂₅ – P₇₅) of 31 – 45 years). Overall, the cosmetic result of incision was rated as excellent (0 score) in 19 (23.46%) patients, good (1 score) in 38 (46.91%), fair (2 score) in 14 (17.28%), and poor (3 score) in 10 (12.34%) (Table 2, Figure 2).

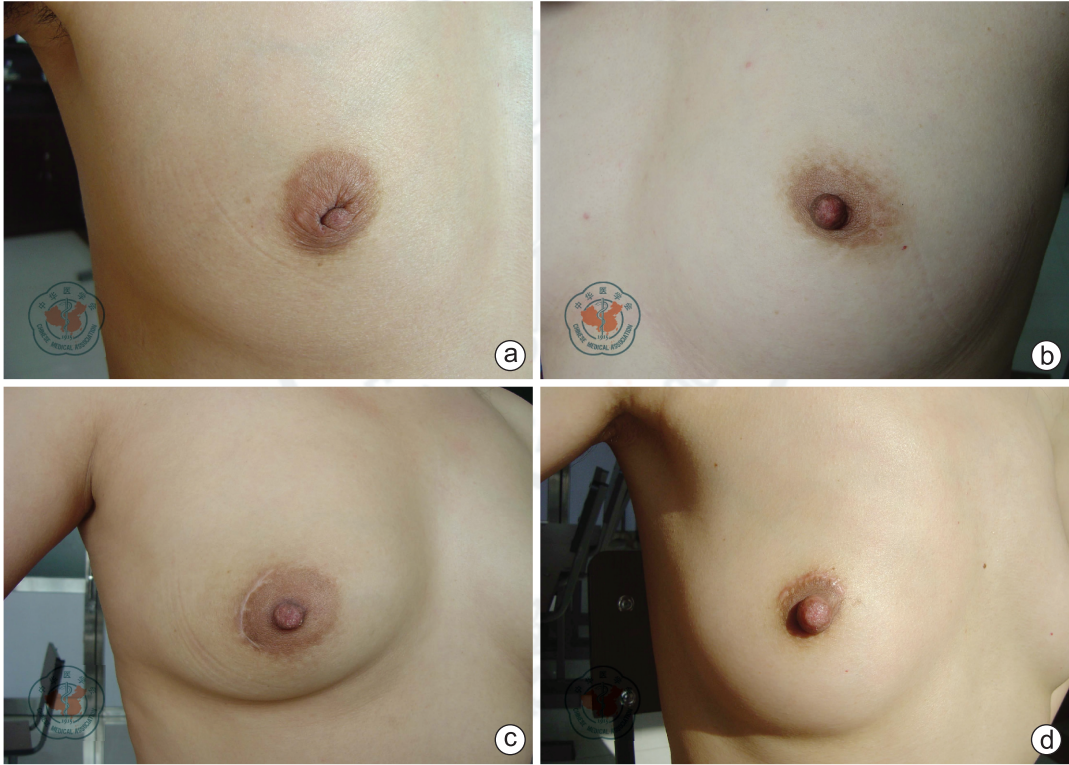
Age, incision location, and scar color all affected cosmetic results on univariate analysis. Scar color includes no scar (not visible), white scar, and

red scar (Figure 3). Older patients had better cosmetic outcomes of incision than younger ones. Patients with no scar obtained better cosmetic outcomes than those with white scar or red scar. Patients with the inferior or lateral periareolar incision obtained better cosmetic outcomes than those with the superior or medial (Table 3).

Table 2 Cosmetic outcome at 6-month follow-up

Assessment	Number of operated breasts ^a	Percentage
Excellent	19	23.46
Good	38	46.91
Fair	14	17.28
Poor	10	12.34

^a A total of 74 patients of 81 breast operations (seven people had bilateral breast operations) were evaluated.



a; unobtrusive; b; visible but not affecting the cosmetic results; c; visible and detracting from the cosmetic results; and d; visible and detracting notably from the cosmetic results

Figure 2 Surgical scar at 4 grades



a; no scar; b; white scar; c; red scar

Figure 3 The appearance of breast with different scar colors

The mean age in the patients with different incision locations showed a statistically significant difference ($F = 0.99, P = 0.40$), even in four age groups ($\chi^2 = 2.01, P = 0.57$, Table 4), which showed that age had no significant relationship with different incision locations.

Scar colors showed significant differences in different incision locations. More cases with no scar or white scar were observed in the inferior or lateral periareolar incision. More cases with red scar were observed in the medial or superior periareolar incision. Except the influence of age, incision location had significant relationship with scar colors (partial correlation coefficient, $r_s = 0.38, P = 0.00$) (Table 5).

Cosmetic outcome of incision or scar color had significant relationship with age. Older patients obtained better cosmetic results and included more cases of no scar or white scar (Table 6).

On univariate logistic regression analysis, age, incision location and scar color were all the factors

affecting the cosmetic outcomes of incision. Patients more than 45 years had better cosmetic outcomes of incision than those less than 31 years. Patients with no scar obtained better cosmetic outcomes than those with white scar or red scar. Patients with the inferior or lateral periareolar incision obtained better cosmetic outcomes than those with the superior or medial (Table 7).

Based on the results of univariate logistic regression analysis, using patients' age, incision location, scar color respectively as dummy variables, multivariate analysis was performed with logistic regression for screening the factors affecting cosmetic outcome of incision. On multivariate logistic regression analysis, the factors affecting cosmetic outcome of incision by descending order of influence were red scar, white scar, incision location, and age. Patients more than 45 years, with no scar, and the inferior or lateral periareolar incision had better cosmetic outcomes of incision (Table 8).

Table 3 The impact of age, incision location and scar color on cosmetic outcome [n(%)]

Variable group	Breasts	0 score	1 score	2 scores	3 scores	χ^2 value	P value
Age (years)						9.52	0.02
<31	18	3(16.67)	5(27.78)	7(38.89)	3(16.67)		
31-38	21	4(19.05)	9(42.86)	3(14.29)	5(23.81)		
39-44	17	3(17.65)	10(58.82)	3(17.65)	1(5.88)		
≥ 45	25	9(36.00)	14(56.00)	1(4.00)	1(4.00)		
Incision location						15.08	0.00
Inferior	11	7(63.64)	4(36.36)	0(0.00)	0(0.00)		
Lateral	25	5(20.00)	16(64.00)	3(12.00)	1(4.00)		
Superior	37	6(16.22)	16(43.24)	6(16.22)	9(24.32)		
Medial	8	1(12.50)	2(25.00)	5(62.50)	0(0.00)		
Scar color						45.09	0.00
No scar	20	16(80.00)	4(20.00)	0(0.00)	0(0.00)		
White scar	42	3(7.14)	28(66.67)	11(26.19)	0(0.00)		
Red scar	19	0(0.00)	6(31.58)	3(15.79)	10(52.63)		

Table 4 Comparison of age in different incision locations

Incision location	Breasts	Age (years, $\bar{x} \pm s$)	Age [n(%)]			
			<31 years	31-38 years	39-44 years	≥ 45 years
Inferior	11	40.55 \pm 12.84	3(27.27)	2(18.18)	2(18.18)	4(36.36)
Lateral	25	40.68 \pm 9.32	4(16.00)	5(20.00)	7(28.00)	9(36.00)
Superior	37	37.95 \pm 10.40	8(21.62)	12(32.43)	7(18.92)	10(27.03)
Medial	8	33.88 \pm 13.51	3(37.50)	2(25.00)	1(12.50)	2(25.00)

Table 5 Comparison of scar colors in different incision location n(%)

Incision location	Breasts	No scar	White scar	Red scar	χ^2 value	P value
Inferior	11	9(81.82)	1(9.09)	1(9.09)	16.11	0.00
Lateral	25	6(24.00)	15(60.00)	4(16.00)		
Superior	37	5(13.51)	20(54.05)	12(32.43)		
Medial	8	0(0.00)	6(75.00)	2(25.00)		

Table 6 Comparison of age in different cosmetic outcome of incision and scar colors

Variable	Breasts	Age ($\bar{x} \pm s$, years)	F value	P value
Cosmetic outcome of incision			5.91	0.00
0 score	19	40.95 \pm 9.74		
1 score	38	41.97 \pm 10.66		
2 score	14	30.07 \pm 9.99 ^{ab}		
3 score	10	34.40 \pm 5.85		
Scar color			3.64	0.03
No scar	20	40.55 \pm 12.84		
White scar	42	40.68 \pm 9.32		
Red scar	19	37.95 \pm 10.40 ^c		

a: $P < 0.01$, compared with 0 score group; b: $P < 0.01$, compared with 1 score group; c: $P < 0.01$, compared with "no scar" group

Table 7 The results of univariate logistic regression analysis affecting the cosmetic outcomes

Factor dummy	Estimate	Standard error	Wald Chi-square	P value	Standardized estimate	Odds ratio estimates(95% CI)
Age (years)	-0.5877	0.1932	9.2496	0.0024	-0.3719	0.556 (0.380-0.811)
31 ~ 39	-0.3730	0.5926	0.3961	0.5291	-0.3730	0.689 (0.216-2.200)
39 ~ 45	-0.9046	0.6363	2.0206	0.1552	-0.2044	0.405 (0.116-1.409)
>45	-1.7485	0.6082	8.2656	0.0040	-1.7485	0.174 (0.053-0.573)
Incision location	1.4295	0.4521	9.9989	0.0016	0.3941	4.177 (1.722-10.131)
Scar color	3.1825	0.4650	46.8418	<0.0001	1.2249	24.107 (9.690-59.972)
White scar	2.9745	0.6765	19.3320	<0.0001	0.8245	19.580 (5.199-73.731)
Red scar	5.5498	0.8610	41.5529	<0.0001	1.3046	257.198 (47.580->999.999)

Table 8 The results of multivariate logistic regression analysis affecting the cosmetic outcomes

Factor	Estimate	Standard error	Wald Chi-square	P value	Standardized estimate	Odds ratio estimates(95% CI)
Age>45 years	-1.1976	0.5480	4.7759	0.0289	-0.3069	0.302 (0.103-0.884)
Incision location	1.1734	0.5032	5.4374	0.0197	0.3235	3.233 (1.206-8.668)
White scar	2.7021	0.7118	14.4102	0.0001	0.7490	14.911 (3.695-60.171)
Red scar	5.3637	0.9043	35.1823	<0.0001	1.2608	213.520 (36.284->999.999)

3 Discussion

The breast biopsy incision is made directly over the lesions, which is likely to create prominent scars. The surgical scars may have a bad influence on the quality of life of the patients. The periareolar incision is usually barely visible and is a suitable approach for most breast operations, which can improve the aesthetic results^[5]. The periareolar incision was first introduced by Dufourmentel in 1928^[6]. A final periareolar scar is more discreet than a scar from direct incision, with an overall better aesthetic result.

Our univariate analysis shows that age, incision location, and scar color all affected cosmetic result. Older patients, with no scar or white scar, and the inferior or lateral periareolar incision had better

cosmetic outcomes of incision. Patients more than 45 years had better cosmetic outcomes of incision than those less than 31 years. Patients with the inferior or lateral periareolar incision obtained better cosmetic outcomes than those with the superior or medial. Patients with no scar obtained better cosmetic outcomes than those with white scar or red scar.

An important factor associated with poor results is scar color^[7]. Red scars are often keloid scars or hypertrophic scars. Keloid scars are large, bulky, raised, reddish scars that are developed at the operation site^[8]. A hypertrophic scar looks similar to a keloid scar^[9]. Hypertrophic scars are more common, but they do not grow as big as keloid scars and often subside by themselves. A hypertrophic

scar remains within the range of the original wound. If it grows beyond the original wound's boundary, it becomes a keloid scar. White scars are often normal scars that have not faded and remain noticeable. The analysis shows that except the influence of age, incision location has a significant relationship with scar colors. More cases of no scar or white scar were observed in the inferior or lateral periareolar incision. More cases of red scar were observed in the medial or superior periareolar incision. Perhaps patients with inferior or lateral periareolar incision have better cosmetic results because of little skin tension of the incision. The analysis also shows that cosmetic outcome of incision or scar colors have a significant relationship with age. Older patients had more cases of no scar or white scar and then obtained better cosmetic results. Younger people generally healed more easily than older people, but older people's scars faded more rapidly.

For all the surgical breast biopsy procedures, we have used this incision to access lesions in any quadrant by subcutaneous tunneling maneuver. The subcutaneous excisional biopsy was made along the periareolar incision after subcutaneous tunneling maneuver. The periareolar incision may be used for both benign and malignant conditions^[10-11]. Mobile benign lumps such as fibroadenomas can be excised unless they are closer to the other natural skin crease incisions of the axilla or the inframammary sulcus^[12]. The procedures like major duct excision are also possibly performed by this approach. Excision of impalpable mammographic lesions can be achieved from this incision. It is important to mark the lesion location with wire guidance to allow accurate surgical biopsy. X-ray control of the specimen was necessarily used to ensure adequate excision.

Overall, we concluded that cosmetic outcomes after periareolar excisional biopsy of benign breast lesions were excellent or good in at least 70% of

cases. Age, incision location, and scar color all affected cosmetic results of incision on univariate or multivariate analysis. Older patients, with no scar or white scar, and the inferior or lateral periareolar incision had better cosmetic outcomes of incision.

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(Received: 2013-03-11)

(Edited by LIU Jun-lan)

Zhang ZQ, Feng LY, Li WJ, et al. Factors determining cosmetic results after periareolar excisional biopsy of benign breast lesions[J/CD]. *中华乳腺病杂志: 电子版*, 2013, 7(4):263-268.