

Chinese Women's Preferences and Concerns regarding Incision Location for Breast Augmentation Surgery: A Survey of 216 Patients

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Abstract

Background The axillary approach is the dominant incision used in China for breast augmentation. Systematic preoperative education regarding incision locations for breast augmentation is scarce in China. In this study, we surveyed Chinese patients to ascertain their preferences and concerns for incision location based on a comprehensive understanding of different incisions.

Methods We used a literature review, patient interviews, and expert panels to develop the preoperative education material and questionnaire regarding different incision locations. The respondents were requested to choose one incision location before and after they received the preoperative education. Their initial choices and final decisions as well as the reasons for these choices were recorded and analyzed. Multinomial logistic regression was

performed to analyze the affecting factors on the incision choice.

Results A total of 216 Chinese women participated in the study between 2012.5 and 2014.1. Initially, 176 (81.48 %) women chose axillary incision, 27 (12.50 %) chose periareolar incision, and 13 (6.02 %) chose inframammary fold (IMF) incision. After they received preoperative education on incisions, the axillary and periareolar approaches decreased to 117 (54.17 %) and 13 (6.02 %), respectively, while IMF increased to 86 (39.81 %). The easily hidden scar (43.98 %), lower capsular contracture rate (23.15 %), and lower possibility of injury to the breast parenchyma (17.13 %) ranked as the top 3 reasons for the incision choice. Patients with a preoperative cup size of AA were 12.316 times more likely to choose the axillary approach relative to the IMF approach compared with those with a B cup ($P = 0.044$; 95 % confidence interval [CI] 1.069–141.923). For each one-unit increase in BMI, the odds that a patient would choose the axillary versus the periareolar approach decreased by 32.4 % ($P = 0.049$; 95 % CI 0.457–0.999).

Conclusions The systematic and objective preoperative education material and questionnaire regarding different incision locations helped the Chinese patients make truly informed decisions and express their personal requirements. The axillary approach was the first option for more than half of Chinese women mainly because an easily hidden scar was considered the primary concern during the decision-making process. The patients with a low BMI and a small preoperative breast cup size were more likely to choose an axillary incision. However, a considerable number of Chinese women would choose the IMF incision and value its superiority in terms of a lower capsular contracture rate, less tissue trauma, and lower possibility of injury to the breast parenchyma.

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Keywords Augmentation mammoplasty · Incision location · Chinese women · Decision-making process

Introduction

Breast augmentation via the inframammary fold (IMF) incision is the most widely used approach in Western countries [1, 2]; however, the axillary approach is the dominant incision used in China [3, 4]. Several theories have been described with regard to the differences between these two approaches. Cheng believed that Asian patients have a tendency towards the formation of hypertrophic scars. Therefore, an incision hidden within the axilla is favored [3]. Alpert considered that an inframammary scar might be more prominent on a thin Asian woman who lacks significant breast tissue and defined IMFs [5]. In contrast, Tebbetts believed that an adequate incision length, with care to avoid trauma to the edges of the skin and with the use of precise closure techniques, produced scars of equivalent quality at all of the current incision locations in a wide range of skin types [6]. Furthermore, he believed that patients who were provided sufficient information about the potential benefits and concessions of all types of incisions would overwhelmingly choose the inframammary approach [7].

The preference of the incision location for breast augmentation is a personal one that is influenced by many factors including the patient's understanding of the various options, body habitus, and personal requirements. The experience and preference of the surgeon also play a role. Thus far, systematic preoperative education material with regard to the different incision locations for breast augmentation is still scarce in China, and most Chinese women obtain their knowledge from Internet sources, advertisements, and the experiences of friends. Therefore, they often struggle to make a truly informed decision, in part because of their limited knowledge of the incision approaches.

Few studies have described the decision-making process with respect to incision locations for breast augmentation, and few have investigated the personal views of the patients. In this study, we surveyed Chinese patients to ascertain their preferences and concerns regarding incision locations based on a comprehensive understanding of the different incision approaches.

Patients and Methods

Ethics Committee Approval and Informed Consent

This study was approved by the institute's ethics committee. Informed consent was obtained prior to the start of the questionnaire.

Inclusion and Exclusion Criteria

Consecutive patients who were seen in our department and who asked for esthetic breast augmentation surgeries with implants due to breast hypoplasia during 2012.5 and 2014.1 were included. After a physical examination and a preliminary decision as to the pocket, implant volume and type, and IMF location, the patients with anatomic variables and constraints that made one incision superior or inferior were excluded. The exclusion criteria are listed in Table 1 [6]. All of the remaining patients were informed as to the purpose of the survey and their answers and personal information were guaranteed to remain private. They were free to decide whether they wished to participate in the study.

Preoperative Education Material

We examined the existing published literature to compile a comparison of axillary, periareolar, and IMF incisions, which were then outlined in a table and served as the preoperative education material. The transumbilical approach was not included because of its infrequent application. The comparison table included scar location, tissue trauma, recovery period, alteration in nipple–areola complex (NAC) sensation, capsular contracture rate, and the possibility of a change in the incision location for a secondary procedure [6–19] (Table 2). The higher risk of alterations in nipple–areola sensation and capsular contracture has remained controversial [15, 20–27], and therefore, we searched the relevant literature and listed the range of alteration rates in nipple–areola sensation and capsular contracture rates of the 3 incision types as reported in various studies. Few randomized controlled trials were found in the related fields. The studies provided evidence levels of grades 3–4. Expert panels at the Plastic Surgery Hospital (Institute), Chinese Academy of Medical Sciences (CAMS), Peking Union Medical College (PUMC) reviewed the draft of the preoperative education material.

Questionnaire of Incisions

We conducted semi-structured interviews with 20 patients to determine their concerns about incisions for breast augmentation surgery. The recorded data were then used to generate the items on the questionnaire.

Table 1 Exclusion standard [6]

Exclusion standard
Tuberous breast deformity
Constricted lower pole
High or tight inframammary fold
An extremely strong history of hypertrophic scarring
Small areola (less than 3.5 cm diameter) ^a
Severe glandular ptotic
Areolar asymmetries, deformities, and nipple–areola malposition that require correction at the time of breast augmentation
Any history of parenchymal disease
Obvious breast asymmetry and deformity

^a When planned implant base width exceeds 13 cm for conventional gel implants or exceeds 12 cm for form stable gel implants

Plastic surgeons, nurses, and psychologists employed at the Plastic Surgery Hospital (Institute), CAMS, PUMC, School of Psychology, Beijing Normal University, and at the Chinese People's Armed Police General Hospital reviewed the initial draft of the questionnaire. The questionnaire then underwent examinations for test–retest reliability and content validity.

The final version of the questionnaire contained the following 3 parts (Fig. 1):

Part I investigated the patients' initial choices and the main reasons for those choices, which were based on their preliminary knowledge.

Part II included the preoperative education material with regard to the incisions. The patients read the comparison table by themselves and were free to ask the surgeon any questions. The surgeon provided explanations when necessary but never provided any advice or suggestions that may have persuaded the patients in any way. All patients consulted the same surgeon. Some patients asked for pictures of scars, which prompted us to provide a series of pictures of incision scars at each location that were obtained approximately 1 year after the surgery. The pictures illustrated different degrees of pigmentation, vascularity, width, and height; the pictures presented scars that ranged from almost invisible to very obvious so as not to influence the patients' decisions. The patients were informed that the scar was a necessary concession of augmentation surgery and that the possible appearance of the scar was related to personal physical differences and variable factors that might result in almost invisible scars or more obvious ones at each incision location.

Table 2 The preoperative education material of the incision locations [6–19]

	Axillary incision	Periareolar incision	IMF incision
Scar location	Transversely in the apical, hair bearing hollow of the axilla	Located at the lower border of the areola from the 3 o'clock to the 9 o'clock position	Located precisely in the postoperative inframammary fold
Tissue trauma	Does not violate the breast parenchyma Needs more dissection as a remote approach	Might traverse breast parenchyma	Does not violate the breast parenchyma
Recovery period	Need to wear an adjustable strap across the upper pole of the breasts to prevent upward migration (for several weeks)	No need to wear a strap	No need to wear a strap
Alteration in NAC sensation		Theoretically interrupts some innervation to nipple and areola	
Loss or reduced sensitivity	1–2 %	9.5 %	3.5 %
Areola pain or hyperesthesia	6 %	14.4 %	4.1 %
Capsular contracture rate	1.3–6.4 %	2.4–9.5 %	0.5–1 %
Secondary procedure	Requires periareola or IMF incision for optimal control	Periareola breast tissue is less sterile and the incidence of capsular contracture is higher No additional incision required for secondary procedure	No additional incision required for possible secondary procedure

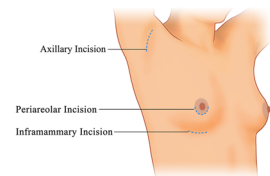
NAC nipple and areola complex

Preoperative Education and Questionnaire regarding Incision location for Breast Augmentation Surgery

Informed Consent: The preoperative education material and questionnaire are parts of a medical research with the purpose to ascertain patient's preferences and concerns regarding different incision locations for breast augmentation surgery. The study has been approved by institute ethics committee. You will be provided with detailed preoperative education material of different incision locations. Your choice and concerns about the incisions will be recorded. Your answers will help the surgeons understand your personal requirements and concerns. All of the data collected will only be used for medical research. Your personal information will never be disclosed by any means. Participation in this research is voluntary, and you may withdraw at anytime. Thank you for your support and cooperation.

I volunteered to participate in the study. Signature _____ Date _____

PART I Breast augmentation surgery is most commonly performed through the 3 incisions shown in the figure.



1) Which incision do you prefer for your breast augmentation surgery?

- Axillary incision
- Periareolar incision
- Inframammary fold incision

2) Please list the main reason influencing this decision. _____

PART II The table lists the description and comparison of the 3 incision locations, which was compiled from a literature review.

	Axillary incision	Periareolar incision	IMF incision
Scar location	Transversely in the typical hair bearing hollow of the axilla.	Located at the lower border of the areola from the 3 o'clock to the 9 o'clock position.	Located precisely in the postoperative inframammary fold
Tissue trauma	Does not violate the breast parenchyma Needs more dissection as a remote approach	Might traverse breast parenchyma	Does not violate the breast parenchyma
Recovery period	Need to wear an adjustable strap across the upper pole of the breasts to prevents upward migration (for several weeks)	No need to wear a strap	No need to wear a strap
Alteration in NAC* sensation		Theoretically interrupts some innervation to nipple and areola	
Loss or reduced sensitivity	1%–2%	9.5%	3.5%
Areola pain or hyperesthesia	6%	14.4%	4.1%
Capsular contracture rate	1.3%–6.4%	2.4–9.5%	0.5–1%
Secondary procedure	Requires periareolar or IMF incisions for optimal control.	No additional incision required for secondary procedure.	No additional incision required for possible secondary procedure.

NAC*: Nipple and areola complex

PART III Please make sure you have fully understood the information. Please feel free to ask any question related.

1) Which incision do you choose for your breast augmentation surgery after reading the table?

- Axillary incision
- Periareolar incision
- Inframammary fold incision

2) Which items do you take into consideration in making the decision? (You are free to select more than one item.)

- A) Lower possibility of injury to the breast parenchyma
- B) Lower alteration rate of NAC sensation
- C) Less tissue trauma
- D) No need to wear a strap during recovery period
- E) Lower capsular contracture rate
- F) Easily-hidden scar
- G) Any other reason _____

3) Which item in Question 2) is your primary concern (deciding factor) in the election of the incision location? (Please select one item only.) _____

4) Which item is your primary concern (deciding factor) in the rejection of the other 2 incisions: (Please select one item for each incision.)

- Incision () Concern: _____
- Incision () Concern: _____
- A) The possibility of injury to the breast parenchyma
- B) Higher alteration rate of NAC sensation
- C) Higher possibility of tissue trauma
- D) Need to wear an adjustable strap during recovery period
- E) Higher capsular contracture rate
- F) The possibility of scar exposure
- G) The possibility of a change in the incision location for secondary procedure
- H) Any other reason _____

AGE: _____

Marital status : Single Married Divorced or Widowed

Average Income Per Month (RMB): ≤3000 3000-10000 ≥10000

Education level: High School Undergraduate Course Graduate Course

Pregnancy History (including full-term pregnancy and miscarriage):

Never 1–3 Times More Than 3 Times

Breast Feeding History: Yes No

Fig. 1 The preoperative education material and questionnaire regarding incision locations for breast augmentation

Part III ascertained the patient's final decision as to the incision location and the primary concerns that influenced that decision.

Statistical analysis

The software program EpiData (version 3.0, www.epidata.dk/) was used for data management. Statistical analyses were performed using the SPSS software (version 21.0, SPSS). A Chi square test and kappa value were used to examine the test–retest reliability of the questionnaire. Frequencies and percentages were used to describe the distributions of the categorical data and the ranked data. The McNemar–Bowker test was used to test the paired nominal-scale data. The demographic data of the patients were analyzed with a multinomial logistic regression model to test the effects of the variables on the choice of incision. Significance was assigned at $P < 0.05$.

Results

A total of 216 patients participated voluntarily in this research study and signed the informed consent from between 2012.5 and 2014.1. The voluntary participation rate was 98.18 % (216/220); the average age of the patients was 31.5 years old (range 18–55 years) and the average BMI was 18.85. All of the patients received silicone gel implants with a textured surface. Two hundred and thirteen patients (98.61 %) received anatomic breast implants, while only 3 patients (1.39 %) received round implants. The average volume of the breast implants was 249.94 ml. It took approximately 15–20 min for the patients to complete the questionnaire.

Test–Retest Reliability and Content Validity Examinations

According to the design of the questionnaire, 24 patients filled in Part III of the questionnaire again 2–4 weeks later. The kappa values are listed in Table 3. The questionnaire showed acceptable test–retest reliability ($P < 0.05$). The opinions of the experts and a literature review confirmed that the items were representative of important domains that were relevant to the incisions for breast augmentation surgery.

Table 3 Test-retest reliability of the questionnaire

Items	Kappa value	<i>P</i>
Final decision	0.851	0.000
The primary concern in the election of the incision location	0.664	0.000
The primary concern in the rejection of periareolar incision	0.689	0.000
The primary concern in the rejection of axillary incision	0.586	0.000
The primary concern in the rejection of IMF incision	1.000	0.000

The questionnaire showed acceptable test–retest reliability ($P < 0.05$)

The Initial Choices of the Patients and Their Primary Reasons

Each respondent chose one incision for augmentation mammoplasty based on her initial knowledge and indicated the main reason for this choice. A total of 176 (81.48 %) patients chose the axillary approach, 27 (12.50 %) chose the periareolar approach, and 13 (6.02 %) chose the IMF approach. The main reasons for these choices are listed in Table 4. Most of the Chinese patients initially preferred an axillary incision because they believed that a scar located in the armpit would be easy to conceal.

The Final Decision of the Patients and Their Primary Concerns

After they read the preoperative education material on the incision locations, the respondents were given the chance to choose one incision location again. Eighty-six (39.81 %) patients changed their initial decisions. The numbers of patients who choose the axillary and the periareolar approaches decreased to 117 (54.17 %) and 13 (6.02 %), respectively, while the number of patients who opted for an IMF incision increased to 86 (39.81 %). The changes in the incision location were analyzed by a McNemar–Bowker test. The results suggested statistically significant

differences in the patients' decisions before and after they received the preoperative education with regard to the different incision locations ($P < 0.05$) (Table 5).

Eighty-six patients changed their initial decisions. Among these, 73 who originally chose the axillary or periareolar approach selected the IMF approach, 8 who originally chose the periareolar approach selected the axillary approach, and 5 who originally chose the axillary approach selected the periareolar approach (Table 5). The primary concerns of the patients who changed their decisions of the incision location are listed in Table 6. Patients who originally chose the axillary or periareolar approach who eventually selected the IMF approach were primarily concerned about the superiority of the IMF incision in terms of the lower capsular contracture rate (32.88 %), the lower possibility of injury to the breast parenchyma (23.29 %), and lower likelihood of tissue trauma (23.29 %). The patients who switched from the periareolar or axillary incision to the other were mostly concerned about the easily concealed scar.

The primary concerns in the election or rejection of one incision are listed in Table 7. The majority of patients who chose the axillary incision and periareolar incision cited easily hidden scars as their primary selection criterion (60.68 % and 92.31 %, respectively, for the axillary and periareolar approaches). However, the patients who opted for the IMF approach were primarily concerned about the lower capsular contracture rate (29.07 %), lower likelihood of tissue trauma (24.42 %) and lower possibility of injury to the breast parenchyma (20.93 %). In contrast, patients who rejected the axillary approach mainly cited the higher possibility of tissue trauma (38.38 %), the need to wear a strap during the recovery period (36.36 %), and the possibility of scar exposure (17.17 %) as their primary concerns. The patients who opted against the periareolar approach did so mostly because of the possibility of injury to the breast parenchyma (31.53 %), higher capsular contracture rate (24.63 %), and higher alteration rate of NAC sensation (15.76 %). All of the patients indicated that the possibility of scar exposure was the deciding factor in their rejection of the IMF incision approach.

Table 4 The initial choices of the patients and their primary reasons

Reason	Axillary	Periareola	IMF	Total (%)
The scar is easy to conceal.	155	16	6	177 (81.94)
Refer to friends' experience	11	2		13 (6.02)
Safety, less injury, sooner recovery period		9	7	16 (7.41)
No damage to mammary gland or lactation ability	8			8 (3.70)
No effect to the nipple sensitivity	2			2 (0.93)
Total (%)	176 (81.48)	27 (12.50)	13 (6.02)	216 (100)

Table 5 The patients' decisions of incision location before and after they received the preoperative education

	Final decision			Total (%)	P
	Axillary	Periareola	IMF		
Initial choice					
Axillary	109	5	62	176 (81.48)	0.000
Periareola	8	8	11	27 (12.50)	
IMF	0	0	13	13 (6.02)	
Total (%)	117 (54.17)	13 (6.02)	86 (39.81)	216 (100)	

One hundred and nine patients still chose axillary incision, 8 patients still chose periareolar incision, and 13 patients still opted for IMF approach. Five patients changed their mind from axillary incision to periareolar incision, 62 patients changed from axillary incision to IMF incision. Eight patients changed from periareolar approach to axillary approach and 11 patients changed from periareolar approach to IMF approach. The changes of incision locations were analyzed by McNemar–Bowker test. The results suggested statistically significant differences in patients' decisions before and after they received the preoperative education ($P < 0.05$)

Table 6 The primary concerns of the patients who changed their decisions of incision location

Initial choice	Final decision	The primary concern	N (%)
Axillary or periareola	IMF	Lower capsular contracture rate	24 (32.88)
		Lower possibility of injury to the breast parenchyma	17 (23.29)
		Less tissue trauma	17 (23.29)
		Easily hidden scar	7 (9.59)
		No need to wear a strap during recovery period	4 (5.48)
		NAC sensation alteration	3 (4.11)
		Others	1 (1.37)
		Total	73 (100)
Periareola	Axillary	Easily hidden scar	4 (50.00)
		Lower capsular contracture rate	2 (25.00)
		Lower possibility of injury to the breast parenchyma	2 (25.00)
		Total	8 (100)
Axillary	Periareola	Easily hidden scar	5 (100)

The overall primary concerns of the patients in their choice of the incision are listed in Table 8. An easily hidden scar (43.98 %), lower capsular contracture rate (23.15 %), and lower possibility of injury to the breast parenchyma (17.13 %) were the top 3 of the patients' overall primary concerns in their decision-making process for the incision location.

The Demographic Data of the Patients and How the Data Might Have Affected the Decision of the Incision Location

The demographic data of the patients are listed in Tables 9 and 10. Each patient's age, marital status, income per-month,

educational background, pregnancy history, breast feeding history, body mass index (BMI), implant volume, and preoperative breast cup size were analyzed by a multinomial logistic regression to test how the decision on the incision location was affected (Tables 11, 12, and 13). The preoperative breast cup size and BMI had significant impacts on the patient's choice of incision location. The patients with a preoperative cup size of AA were 12.316 times more likely to choose the axillary approach relative to the IMF approach compared with those with a B cup ($P = 0.044$; 95 % confidence interval [CI] 1.069–141.923). For each one-unit increase in BMI, the odds that a patient would choose the axillary versus the periareolar approach decreased by 32.4 % (1–0.676) ($P = 0.049$; 95 % CI 0.457–0.999). In other words, for each one-unit decrease in BMI, the odds that a patient would choose the axillary approach versus the periareolar approach increased by 47.9 % (1/0.676–1). This implied that the patients with a lower BMI were more likely to choose the axillary approach rather than the periareolar approach than those with a larger BMI. No other variables were found to have a significant impact on the patient's final decision with regard to the incision location.

Discussion

The choice of the incision location is one of the core steps in breast augmentation surgery. The current incision locations for augmentation mammoplasty include the IMF, periareola, axilla, and umbilicus. Generally speaking, the IMF incision is the most direct and simplest approach because it incurs minimal tissue damage, less pain, and has a shorter recovery period [6, 8, 9]. The periareolar incision is appropriate when mastopexy is needed or in cases of tuberous breast deformity. However, some studies have suggested an increased risk of capsular contracture, alterations in nipple–areola sensation, and injury to the breast

Table 7 The primary concerns in the election or rejection of one incision

Incision	Concerns in the election of the incision	<i>N</i> (%)	Concern in the rejection of the incision	<i>N</i> (%)
Axillary	Easily hidden scar	71 (60.68)	Higher possibility of tissue trauma	38 (38.38)
	Lower capsular contracture rate	25 (21.37)	Need to wear an adjustable strap during recovery period	36 (36.36)
	Lower possibility of injury to the breast parenchyma	19 (16.24)	The possibility of scar exposure	17 (17.17)
	Lower alteration rate of NAC sensation	2 (1.71)	The possibility of a change in the incision location for secondary procedure	7 (7.07)
			Others	1 (1.01)
Total		117 (100)		99 (100)
Periareolar	Easily hidden scar	12 (92.31)	The possibility of injury to the breast parenchyma	64 (31.53)
	No need to wear a strap during recovery period	1 (7.70)	Higher capsular contracture rate	50 (24.63)
			Higher alteration rate of NAC sensation	32 (15.76)
			The possibility of scar exposure	31 (15.27)
			Higher possibility of tissue trauma	26 (12.81)
Total		13 (100)		203 (100)
IMF	Lower capsular contracture rate	25 (29.07)	The possibility of scar exposure	130 (100)
	Less tissue trauma	21 (24.42)		
	Lower possibility of injury to the breast parenchyma	18 (20.93)		
	Easily hidden scar	12 (13.95)		
	No need to wear a strap during recovery period	6 (6.98)		
	Lower alteration rate of NAC sensation	4 (4.65)		
Total		86 (100)		130 (100)

Table 8 The overall primary concerns of the patients in their choice of a particular incision

Concern	<i>N</i> (%)
Easily hidden scar	95 (43.98)
Lower capsular contracture rate	50 (23.15)
Lower possibility of injury to the breast parenchyma	37 (17.13)
Less tissue trauma	21 (9.72)
No need to wear a strap during recovery period	7 (3.24)
Lower alteration rate of NAC sensation	6 (2.78)
Total	216 (100)

parenchyma [6, 13, 15–17]. The axillary incision avoids a breast scar. However, compared with other approaches, the transaxillary approach causes more tissue trauma and a painful and prolonged recovery period [8, 28]. The umbilical approach is the least used because of the additional morbidity and complications related to the creation of the abdominal tunnels and the decreased accuracy of the surgical vision and control.

Spencer [29], Fishman [30], Gladfelter [31], and Spector [32] discussed patient education materials for augmentation mammoplasty but did not include enough specific

Table 9 Patient demographics-1

	Minimum	Maximum	Mean	Std. deviation
AGE	18.00	55.00	31.5093	6.50938
BMI	15.24	23.83	18.8522	1.78667
Implant volume	175.00	315.00	249.9421	30.93076

information about the incision locations. Dowden described that the patients complained that they felt forced to accept the surgeon's preference for the incision location [33]. Tebbetts described an approach that integrated patient education and informed consent in cases of breast augmentation to contribute to a valid decision-making process and to ensure an optimal decision [6, 34]. In China, systematic preoperative education material regarding incisions for breast augmentation surgery is still scarce, and few studies have described the decision-making process of the incision location. The preoperative education and questionnaire on incision locations that we compiled have provided patients with sufficient knowledge, and more importantly, an opportunity to realize and express their personal requirements; this has contributed to an improvement in physician-patient communication and to an

Table 10 Patient demographics-2

	N	Marginal Percentage (%)
Marital status		
Single	81	37.50
Married	118	54.63
Divorced or widowed	17	7.87
Income per-month		
≤3000 (CNY)	58	26.85
3000–10,000 (CNY)	116	53.70
≥10,000 (CNY)	42	19.44
Education background		
High school	46	21.30
Undergraduate	141	65.28
Graduate course	29	13.43
Pregnancy history		
Never	73	33.80
1–3 times	124	57.41
More than 3 times	19	8.80
Breast feeding history		
Yes	105	48.61
No	111	51.39
Preoperative Breast cup size		
AA cup	209	96.76
A cup	2	0.93
B cup	5	2.31

CNY Chinese Yuan

improvement in patient satisfaction. Moreover, a well-informed patient who actively participates in the decision-making process is an essential ingredient for a successful outcome of augmentation mammoplasty.

According to the survey of members of the American Society for Aesthetic Plastic Surgery (ASAPS), 64 % surgeons preferred the inframammary incision, while 25 % preferred the periareolar incision, and 8.7 % preferred the transaxillary approach. Thirty-eight percent of surgeons who were surveyed reported that they used their indicated approach 100 % of the time regardless of the patient's physical characteristics and preference, while 32 % surgeons reported that the incision location was determined mainly according to the patient's preference [1]. Naidu and Codner reported a similar proportion of incision locations used in the USA [35, 36]. However, in China, the axilla is the dominant incision location used in breast augmentation surgery. Our survey found that the axillary incision was the favorable approach by the majority of Chinese patients both before and after they received preoperative education (81.48 % and 54.2 %, respectively) because easily hidden scars were the primary concern of most Chinese patients in the decision-making processes with regard to the incision

location. For these Chinese women, a scar in the axilla was thought to be easier to hide than a scar in the periareolar area or the IMF, because they were worried that a scar in the periareolar area or the IMF might be more visible by their sexual partners on an intimate occasion. This seemed to suggest that some Chinese women might, to a certain extent, worry that their sexual partners might become aware of their breast augmentation history. This noteworthy concept might be related to conservative and traditional Chinese principles. Thus, it would be quite meaningful that the Chinese plastic surgeons pursue refinements in surgical techniques and instrumentations with respect to the axillary incision. This may help to achieve comparable accuracy and control with the IMF approach and minimize tissue trauma and bleeding in order to satisfy the requirements of these Chinese patients.

However, some patients held different viewpoints on which scar location is easier to conceal. Among the 95 patients who selected “easily hidden scar” as their primary concern that prompted a particular incision location, 12 chose a periareolar incision and 12 chose an IMF incision. Some patients mentioned that they were not worried if their sexual partners knew their history of augmentation mammoplasty, but were worried about axillary scar exposure if they wore sleeveless blouses or swimming suits. It seemed that the ideal incision location in terms of how well the scar could be concealed differed among the patients. A patient's individual requirement for an easily hidden scar should be recognized and fully communicated before the surgery.

It was worth noting that nearly 40 % of Chinese women would choose the IMF incision and valued the superiority in the lower capsular contracture rate, less tissue trauma, and a lower possibility of injury to the breast parenchyma over an easily hidden scar. It seemed that the acceptance of the IMF incision by Chinese women had been underestimated. The current low usage of the IMF incision in China is partly due to the limited knowledge of the patients with regard to the superiority of the IMF incision. Preoperative education and the questionnaire provided to the Chinese patients detailed information of incision locations along with the opportunities to express their requirements, and helped reduce unnecessary surgical risks and trauma.

The patients' demographic data were analyzed by a multinomial logistic regression to test the impact of this data on the choice of incision. All the patients in the study received silicone gel implants with a textured surface. Most of them (98.61 %) used anatomic breast implants, and therefore, the implant type was not included in the regression model. We found that preoperative breast cup size and BMI had significant impacts on the patient's decision as to the incision location. Patients with an AA cup were 12.316 times more likely to choose the axillary approach instead of the IMF approach compared with those with a B

Table 11 The outcomes of multinomial logistic regression model (a comparison of the axillary approach and IMF approach)

Parameter estimates								
Final incision decision ^a	B	Std. Error	Wald	df	Sig.	Exp(B)	95 % Confidence interval for EXP(B)	
							Lower Bound	Upper Bound
Axillary								
Intercept	−2.536	2.695	0.886	1	0.347			
AGE	0.028	0.032	0.749	1	0.387	1.028	0.965	1.096
BMI	−0.022	0.098	0.049	1	0.825	0.979	0.808	1.185
Implant volume	0.000	0.005	0.000	1	0.985	1.000	0.990	1.010
Marital status								
Single	0.319	0.786	0.165	1	0.684	1.376	0.295	6.428
Married	−1.020	0.639	2.547	1	0.110	0.361	0.103	1.262
Divorced or widowed	0 ^b			0				
Income per-month								
≤3000 (CNY)	0.068	0.467	0.021	1	0.884	1.071	0.428	2.677
3000–10,000 (CNY)	0.159	0.411	0.149	1	0.700	1.172	0.524	2.622
≥10,000 (CNY)	0 ^b			0				
Education background								
High school	−0.194	0.532	0.132	1	0.716	0.824	0.290	2.338
Undergraduate	0.597	0.456	1.711	1	0.191	1.816	0.743	4.440
Graduate course	0 ^b			0				
Pregnancy history								
Never	−0.638	0.781	0.668	1	0.414	0.528	0.114	2.442
1–3 times	0.521	0.576	0.818	1	0.366	1.684	0.544	5.209
More than 3 times	0 ^b			0				
Breast feeding history								
Yes	−0.313	0.511	0.376	1	0.540	0.731	0.269	1.990
No	0 ^b			0				
Preoperative Breast cup size								
AA cup ^c	2.511	1.247	4.053	1	0.044	12.316	1.069	141.923
A cup	18.208	2415.612	0.000	1	0.994	80874077.866	0.000	^d
B cup	0 ^b			0				

^a The reference category is IMF

^b This parameter is set to zero because it is redundant

^c The preoperative breast cup size had significant impact on the patient's choice of incision location. The patients with a preoperative cup size of AA were 12.316 times more likely to choose the axillary approach relative to the IMF approach compared with those with a B cup ($P = 0.044$; 95 % confidence interval [CI] 1.069–141.923)

^d Floating point overflow occurred while computing this statistic. Its value is therefore set to system missing

cup. For each one-unit decrease in BMI, the odds that a patient would choose the axillary versus the periareolar approach increased by 47.9 %. The results suggested that patients with a low BMI and small preoperative breast cup size were more likely to choose an axillary incision. The slim patients with significant hypoplasia and ill-defined IMFs were more worried that the incision scar might be visible in the periareolar area or the IMF and tended to choose an axillary incision. The discovery of correlations between BMI and preoperative breast cup size with incision choices was in agreement with some expert opinions

on the issue [5, 8]. Asian women are usually short and slim with a low BMI and small breasts compared with Westerners and African Americans [3]. An axillary incision is particularly advantageous in some Chinese patients with small breasts and ill-defined IMFs.

One limitation of this study was that the data were collected from a single center. However, the patients were included in the study consecutively, and the sample size suggested appropriate representation. Moreover, it was difficult to examine the test–retest reliability of Part I of the questionnaire when the setting of this study was

Table 12 The outcomes of multinomial logistic regression model (a comparison of the IMF incision and periareola incision)

Parameter estimates								
Final incision decision ^a	B	Std. error	Wald	df	Sig.	Exp(B)	95 % Confidence interval for exp(B)	
							Lower bound	Upper bound
IMF								
Intercept	39.691	679.426	0.003	1	0.953			
AGE	0.002	0.067	0.001	1	0.975	1.002	0.880	1.142
BMI	−0.370	0.203	3.325	1	0.068	0.690	0.464	1.028
Implant volume	−0.008	0.011	0.457	1	0.499	0.992	0.970	1.015
Marital status								
Single	−0.932	2.001	0.217	1	0.641	0.394	0.008	19.877
Married	0.048	1.250	0.001	1	0.969	1.049	0.091	12.158
Divorced or Widowed	0 ^b			0				
≤3000 (CNY)	1.323	0.919	2.069	1	0.150	3.753	0.619	22.749
3000–10,000 (CNY)	1.222	0.812	2.262	1	0.133	3.393	0.690	16.681
≥10,000 (CNY)	0 ^b			0				
Education background								
High school	−0.832	1.307	0.406	1	0.524	0.435	0.034	5.632
Undergraduate	−1.498	1.165	1.653	1	0.198	0.223	0.023	2.193
Graduate course	0 ^b			0				
Pregnancy history								
Never	−12.760	679.407	0.000	1	0.985	2.873E−006	0.000	. ^c
1–3 times	0.221	0.918	0.058	1	0.810	1.247	0.206	7.540
More than 3 times	0 ^b			0				
Breast feeding history								
Yes	−14.574	679.405	0.000	1	0.983	4.685E−007	0.000	. ^c
No	0 ^b			0				
Preoperative breast cup size								
AA cup	−14.589	0.000	0.000	1	0.999	4.616E−007	4.616E−007	4.616E−007
A cup	−28.708	4033.209	0.000	1	0.994	4.406E−013	0.000	. ^c
B cup	0 ^b			0				

No variables were found to have a significant impact on the patient's final decision with regard to the incision location

^a The reference category is periareola

^b This parameter is set to zero because it is redundant

^c Floating point overflow occurred while computing this statistic. Its value is therefore set to system missing

considered. The important items in Part III that related to the statistical analysis were included in a test–retest reliability examination. The results demonstrated good reliability. In addition, the capsular contracture rate of the different incisions remained controversial [24, 26, 27]. The core study of Natrelle round silicone breast implants at 10 years post-surgery reported a lower capsular contracture rate for the IMF approach (17.4 %) and the periareolar approach (18.6 %) as opposed to the axillary approach (23.6 %), but the difference was not significant [37]. Some other core studies and evidence-based medicine studies did not provide the specific capsular contracture rate of the different incision locations [25, 38–40]. However, some

experts believed that the periareolar incision is associated with a higher risk of capsular contracture because of possible implant contamination (due to the transection of parenchymal ducts that are often colonized by bacteria) [6, 15, 17, 19, 20, 41–43]. Few randomized controlled trials and systematic reviews were conducted in related fields, so in the comparison table, we listed the range of the capsular contracture rates of the 3 incision types that were reported in different studies; this was then given as the preoperative education material, and expert panels reviewed the draft of the preoperative education material to avoid possible errors and bias. So as not to mislead the patients, we also explained to the patients during the survey that the capsular

Table 13 The outcomes of multinomial logistic regression model (a comparison of axillary approach and periareola approach)

Parameter estimates								
Final incision decision ^a	B	Std. error	Wald	df	Sig.	Exp(B)	95 % confidence interval for exp(B)	
							Lower Bound	Upper Bound
Axillary								
Intercept	37.155	679.426	0.003	1	0.956			
AGE	0.030	0.066	0.211	1	0.646	1.031	0.906	1.172
BMI ^b	−0.392	0.199	3.866	1	0.049	0.676	0.457	0.999
Implant volume	−0.008	0.011	0.480	1	0.489	0.992	0.970	1.014
Marital status								
Single	−0.612	1.960	0.098	1	0.755	0.542	0.012	25.251
Married	−0.972	1.188	0.669	1	0.413	0.378	0.037	3.884
Divorced or widowed	0 ^c			0				
Income per-month								
≤3000 (CNY)	1.391	0.910	2.336	1	0.126	4.019	0.675	23.920
3000–10,000 (CNY)	1.380	0.804	2.949	1	0.086	3.976	0.823	19.217
≥10,000 (CNY)	0 ^c			0				
Education background								
High school	−1.026	1.322	0.602	1	0.438	0.358	0.027	4.784
Undergraduate	−0.902	1.169	0.595	1	0.441	0.406	0.041	4.016
Graduate course	0 ^c			0				
Pregnancy history								
Never	−13.398	679.407	0.000	1	0.984	1.518E−006	0.000	^d
1–3 times	0.742	0.937	0.627	1	0.428	2.100	0.335	13.163
More than 3 times	0 ^c			0				
Breast feeding history								
Yes	−14.887	679.405	0.000	1	0.983	3.425E−007	0.000	^d
No	0 ^c			0				
Preoperative Breast cup size								
AA cup	−1.2078	1.247	2.071	1	0.149	0.30	0.021	3.69
A cup	−11.500	3757.676	0.000	1	0.998	1.013E−005	0.000	^d
B cup	0 ^c			0				

^a The reference category is periareola

^b The BMI had a significant impact on the patient's choice of incision location. For each one-unit increase in BMI, the odds that a patient would choose the axillary versus the periareola approach decreased by 32.4 % (1−0.676) ($P = 0.049$; 95 % confidence interval [CI] 0.457–0.999). In other words, for each one-unit decrease in BMI, the odds that a patient would choose the axillary approach versus the periareola approach increased by 47.9 % (1/0.676−1)

^c This parameter is set to zero because it is redundant

^d Floating point overflow occurred while computing this statistic. Its value is therefore set to system missing

contracture rates of the different incision locations remained controversial, and that the range of capsular contracture rates listed were obtained from different studies.

Further studies have been designed to follow up the participants to evaluate their outcomes, including complications, scar conditions, and postoperative satisfactions, to assess the effectiveness of the preoperative education and questionnaire regarding incision locations. In the long term, the preoperative education and questionnaire of the incisions will help more Chinese women understand the surgery in great detail, help them make informed decisions,

and achieve satisfactory effects with fewer risks and less trauma. More importantly, preoperative education on incision locations may make a difference now and may even change the future of Chinese plastic surgery.

Conclusion

The systematic and objective preoperative education material and questionnaire regarding different incision locations helped the Chinese patients fully understand the

characteristics of the different incisions, helped them make truly informed decisions, and helped them express their personal requirements. More than half of the Chinese patients opted for the axillary approach mainly because an easily hidden scar was considered the primary concern during the decision-making process. The patients with a low BMI and a small preoperative breast cup size were more likely to choose an axillary incision. However, a considerable number of Chinese women would choose the IMF incision and value its superiority in terms of a lower capsular contracture rate, less tissue trauma, and lower possibility of injury to the breast parenchyma. Patients should be provided with detailed preoperative education on each incision location and be encouraged to choose incisions based on a comprehensive understanding and their personal requirements.

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Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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