

Implant Size Selection on the Basis of Period, Parity, and Age: A 22-year Retrospective Analysis of 2591 Primary Augmentation Mammoplasties

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Background: The size of implants can be selected objectively or subjectively. However, there is a lack of information on whether there is a change in the trend in implant size selection or whether the parity or the age can have an impact on the implant size used.

Methods: A retrospective study to analyze implant size selection following primary augmentation was performed. Data were divided into three groups. Group A had mammoplasties between 1999 and 2011 (group 1) and 2011 and 2022, respectively (group A2). Groups B and C were divided on the basis of age and the number of children.

Results: Group A1 included 1902 patients and group A2 included 689 patients. Group B included three subgroups: group B1 included 1345 patients who were 18–29 years old, group B2 included 1087 patients who were 30–45 years old, and group B3 had 127 patients who were 45 years or older. Group C included four subgroups: group C1 had 956 patients without children, group C2 had 422 patients who had one child, group C3 had 716 patients who had two children, and group C4 had 453 patients who had three or more children.

Conclusions: The data showed that there was a trend toward larger size implants, and patients with children had larger implants than nulliparous patients. There was no difference seen in implant size used when patients were compared on the basis of age. (*Plast Reconstr Surg Glob Open* 2023; 11:e5042; doi: [10.1097/GOX.0000000000005042](https://doi.org/10.1097/GOX.0000000000005042); Published online 12 June 2023.)

INTRODUCTION

Since the introduction of breast implants in the 1960s,¹ implant size selection for mammoplasty has been a very challenging subject for patients and surgeons. Efforts have been made to reduce the potentially preventable reoperation rate for changes in the size or shape of implants, ranging between 15% and 24%, following augmentation mammoplasty.² An individual process of implant size selection,^{3–5} type of implant used,⁶ general physical build and frame of the patient, wishes of the patient,⁷ regional trends,⁸ trial of measured rice bags at home,⁹ and implant pocket used for breast implant placement¹⁰ has been analyzed to restrict and

reduce this nonclinical reoperation rate. From the process of breast implant selection to the whole collective process of breast augmentation, each single facet of the surgical process, including the patient education, informed consent, tissue-based implant selection, surgical technique, and postoperative care, was also integrated to analyze its impact on the revision rate for this potentially preventable reason.² Regardless of the methodology used for preoperative implant size selection, when decisions are primarily made by the surgeon or when patients' desires are considered, tissue characteristics and breast footprint play the most vital role in appropriate size implant selection and an aesthetically pleasing adequate outcome.^{3–5,11} However, there is a paucity of information on the implant sizes used for augmentation due to any change in trend or impact of age or parity of a patient on selecting the size of the implant for primary augmentation mammoplasty. The current study involves a review of 2591 patients who had their surgery performed by a single surgeon in his practice for the past 22 years.

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MATERIAL AND METHODS

A retrospective study to analyze implant size selection following primary augmentation was performed between May 1999 and April 2022. Patients with ptosis requiring mastopexy with augmentation mammoplasty were excluded from the study. The data were analyzed on the basis of the make, texture, profiles, and positioning of the implants. Data were also divided into three groups.

Group A: This group was further divided into group A1 and group A2. Group A1 had their mammoplasties performed between 1999 and 2011, and group A2 had procedures performed between 2011 and 2022.

Group B: This group was further divided into three groups on the basis of their ages. Group B1 included patients between 18 and 29 years of age, group B2 included patients between 30 and 45 years, and group B3 included patients 45 years or over.

Group C: This group was studied on the basis of the number of children they had. The group was further divided into four groups on the basis of the number of children they had. Group C1 included patients with no children, group C2 included patients with one child, group C3 included patients with two children, and group C4 included patients with three or more children.

All patients were consulted, operated on, and followed up by the same surgeon. The consultation process included a meticulous clinical history, including the patients' date of surgery, age, and parity. Breast cup sizes, tissue thickness, stretchability, and breast footprint were noted. Patients' desires for their intended cup size were discussed. Patients in appropriate size-stretchable brassieres tried implants of varying sizes, and final selection was titrated with their breasts' physical characteristics. In patients with breast asymmetries, implants of the same and different sizes and profiles were tried and selected. Before and after pictures of patients with similar age, body size, and breast physical characteristics are shown.

Statistical Analysis

The data were analyzed using the Statistical Package for the Social Sciences, version 19.0. The results are presented in the text as the frequency and percentage for qualitative/categorical variables (differences in implant size) and mean \pm SD for quantitative/continuous variables (age and implant size). The chi-square test was used to compare the categorical variables, and the *t* test was used for quantitative/continuous variables. In all statistical analyses, only *P* values less than 0.05 were considered significant.

RESULTS

Implants used in the series were identified on the basis of make, texturing, profile, and implant pocket positioning.

The 2591 bilateral breast augmentations included the following make of implants: 1344 (51.9%) Perouse

Takeaways

Question: The size of implants used in groups from different periods, ages, and parities.

Findings: Patients are requesting larger implant volume now; there is no volume difference on the basis of their ages, and nulliparous patients had smaller volume implants.

Meaning: This is important data, giving information on implant selection by patients from different ages, parities, and periods.

Plastie Perthese patients, 727 (28.1%) Allergan patients [Inspira Natralle 248 (9.6%), Inamed 442 (17.1%), BRST 37 (1.4%)]. Nagor implants were used in 229 (8.8%) patients, Poly Implant Prothese was used in 150 (5.8%) patients, Mentor was used in 124 (4.8%) patients, and Eurosilicone was used in 14 (0.5%) patients. Sebbin and Motiva were used in one patient, and implant make was not recorded in one patient (Fig. 1).

Of the 2591 patients, 477 (18.4%) had textured implants (surface texture area 200–300 mm²), 2112 (81.5%) patients had microtextured implants (texture surface area 100–200 mm²), and 157 (6%) patients had smooth implants (texture surface area 80–100 mm²) (Fig. 2). Of these 2591 patients, 86 (3.3%) had low profile, 100 (4.0%) had a moderate profile, 2181 (84.1%) had a high profile, 193 (7.4%) had extra high profile implants, and 21 (0.9%) had a combination of various profile implants. The profile of the implants was not recorded in 10 (0.4%) patients (Fig. 3). Implant positioning was also analyzed in 2591 patients, and of these, 1660 (64.1%) had implants in the muscle-splitting biplane, 824 patients had implants in subglandular plane, 105 (4%) had implants in partial submuscular pockets, and two (0.1%) implant pockets were not recorded (Fig. 4).

Group A included 2591 patients. This group was further divided into groups A1 and A2. Group A1 included 1902 patients who underwent surgery between 1999 and 2010. Of these 1902 patients, 173 patients had different-size implants (right side mean, 334 cm³; range, 220–700; SD \pm 67.4; and left side mean, 324 cm³; range, 200–500; SD \pm 72.9), and 1729 patients had same-size implants (mean, 328 cm³; range, 200–700; SD \pm 93.1). Group A2 included 689 patients who underwent surgery between 2011 and 2022. Of these, 133 patients had different-size implants (right mean, 346 cm³; range, 200–525; SD \pm 56.9; and left mean, 339 cm³; range, 170–545; SD \pm 60.3), and 556 patients had same-size implants (mean, 347 cm³; range, 200–655; SD \pm 59.9).

Group B included 2591 patients and was further divided into subgroups: B1–B3. Of these 2591 patients, the ages of three patients were not recorded, and complete data were available for 2588 patients. Group B1 included 1345 patients who were 18–29 years of age. Of these, 180 patients had different implant sizes (right mean, 335 cm³; range, 200–700; SD \pm 65.7; and left mean, 332 cm³; range, 170–555; SD \pm 70.4). Of 1345 patients, 1165 patients had

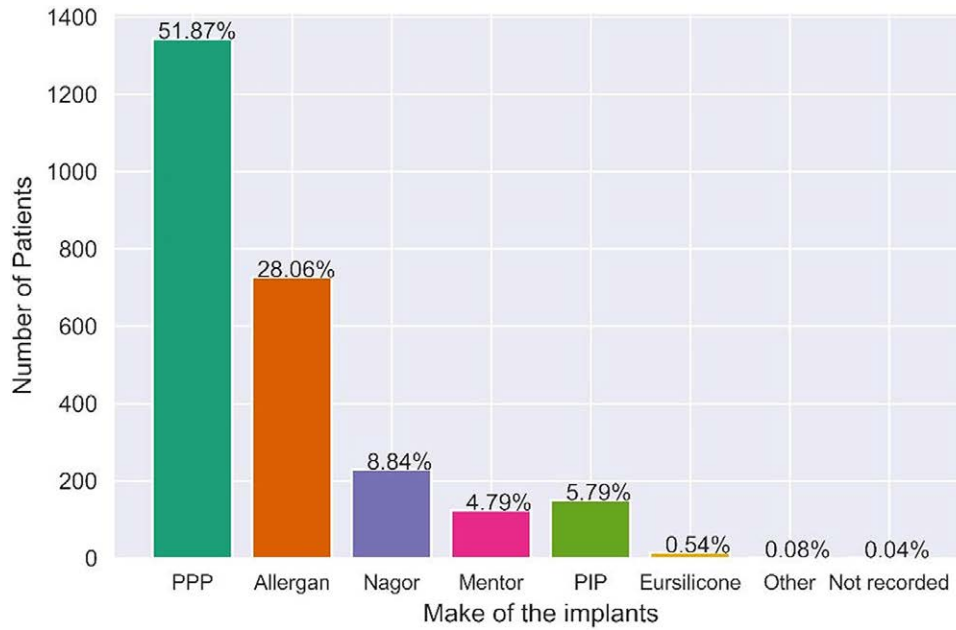


Fig. 1. Make of the implants used in the series.

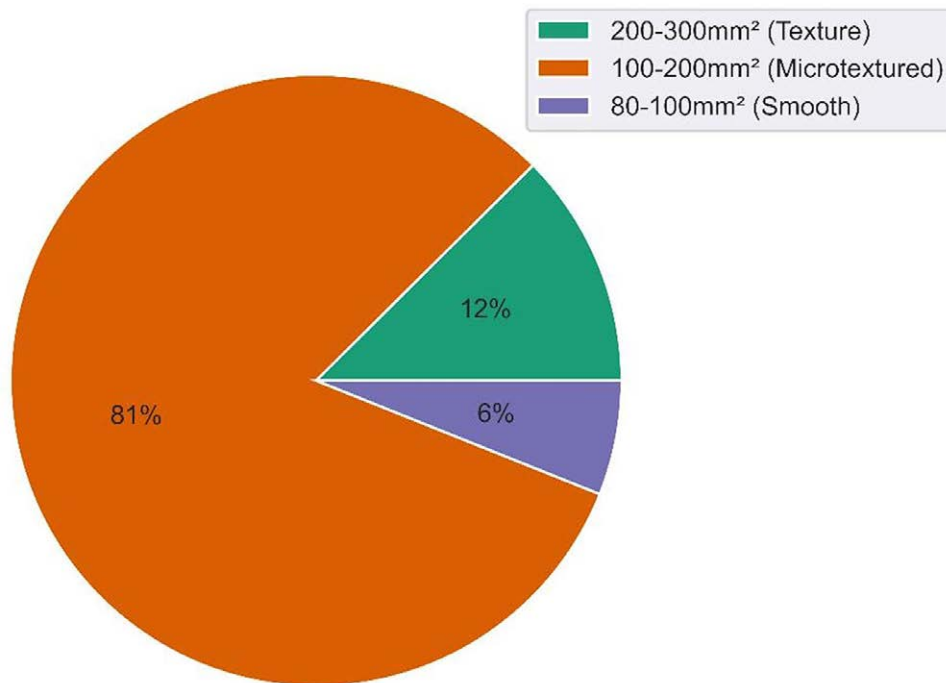


Fig. 2. Distribution of the implants on the basis of texturing. STA indicates surface texture area.

same-size implants (mean, 332 cm³; range, 200–615; SD ± 52.4). Group B2 included patients who were 30–45 years old and included 1087 patients. Of these, 113 patients had implants of different sizes (right mean, 348 cm³; range, 230–525; SD ± 57.3; and left mean, 333 cm³; range, 200–545; SD ± 65.2). Of these, 974 patients had same-size implants (mean, 335 cm³; range, 200–700; SD ± 117.8). Group B3 comprised patients who were 45 years or older

and included 127 patients. Of these, 10 patients had implants of different sizes (right mean, 281 cm³; range, 260–465; SD ± 103.0, and left mean, 281 cm³; range, 295–400; SD ± 59.2), and 117 patients had implants of the same size (mean, 327 cm³; range, 205–500; SD ± 55.5).

Group C included 2591 patients who had breast augmentations and were stratified on the basis of parity. Of these 2591, for 44, the parities or number of children were

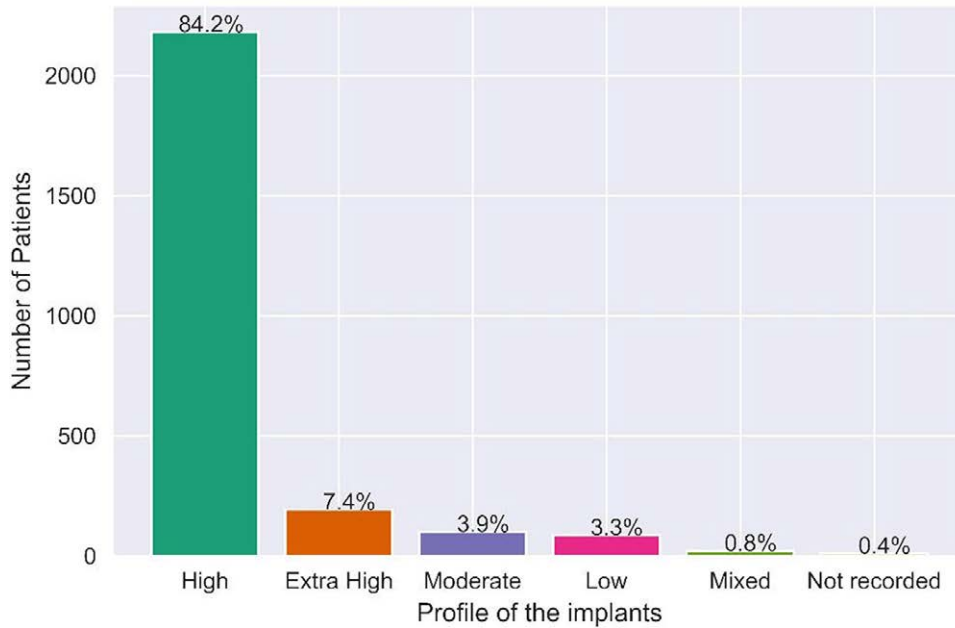


Fig. 3. Profile of the implants in the series.

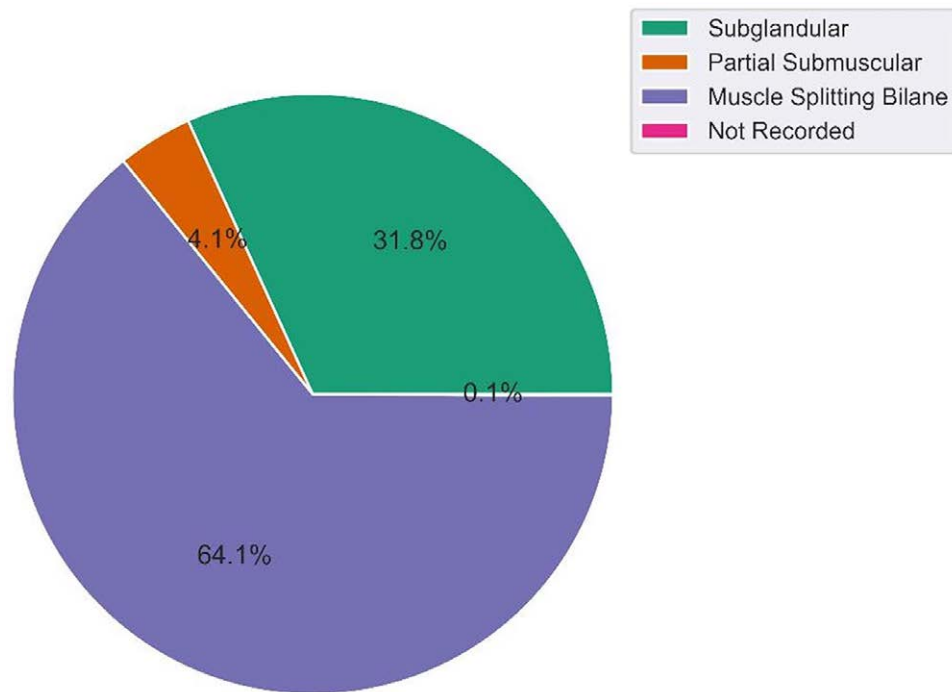


Fig. 4. Pockets used for the implant placement in the series.

not recorded. Group C1 included 956 patients who did not have any children. Of these, 135 patients had implants of different sizes. The mean implant size on the right side was 329 cm³ (range, 200–700; SD ± 62.4), and the mean size on the left side was 324 cm³ (range, 170–540; SD ± 71.3). In this group, 821 patients had implants of the same size (mean, 324 cm³; range, 200–615; SD ± 50.7). Group

C2 included 422 patients who had one child. Of these, 49 patients had implants of different sizes. Mean implant size on the right side was 351 cm³ (range, 240–605; SD ± 73), and the mean size on the left side was 346 cm³ (range, 230–555; SD ± 75.9). In this group, 373 patients had same-size implants with a mean of 332 cm³ (range, 220–620; SD ± 57.8). Group C3 included 716 patients who had two

children. Of these, 67 patients had implants of different sizes. The mean implant size on the right side was 341 cm^3 (range, 230–495; $\text{SD} \pm 53.2$), and the mean size on the left side was 330 cm^3 (range, 225–450; $\text{SD} \pm 55.4$). In this group, 649 patients had implants of the same size (mean, 333 cm^3 ; range, 205–605; $\text{SD} \pm 51.9$). Group C4 included 453 patients who had three or more children. Of these, 48 patients had implants of different sizes. The mean implant size on the right side was 349 cm^3 (range, 200–525; $\text{SD} \pm 62.7$), and the mean size on the left side was 333 cm^3 (range, 230–465; $\text{SD} \pm 62.6$). In this group, 405 patients had same-size implants with a mean of 338 cm^3 (range, 200–655; $\text{SD} \pm 58.2$).

DISCUSSION

Implant size selection can be purely objective based on physical characteristics of the breast tissue or can be subjective and may include patient's desire, surgeon's preferences, and regional variation.^{2–5} In both, objective and subjective, the footprint and base of the breast along with the available skin envelope, tissue, and implant characteristics play an important role.¹² Both these objective and subjective methods are time tested along with their positive and negative benefits, which have been strongly debated.^{13,14} The advantage of breast implant sizers used for preoperative breast cup size simulation not only makes the process inclusive but also has been shown to reduce the postoperative reoperation rate in routine augmentation mammoplasty.⁵ The process is particularly useful in patients who present with breast asymmetry.^{5,15,16} The use of three-dimensional imaging has been employed as a

useful resource for breast implant size selection and can be an extremely helpful tool in augmentation mammoplasty in patients with asymmetrical breasts.^{16,17}

Even though there is enough emphasis on implant size selection and various modalities adopted to accomplish desired results with mean size of implants used, there is a lack of information on the trend in the size of the implants selected or used, whether there was any particular age group of patients selecting any particular size implants, or any impact on the number of pregnancies that may influence the choice or desire or need for a particular size implant. The current study may be limited to a single-surgeon practice in Southeast England and reflect a regional variation or surgeon's preference or bias; however, the size of the study and the range of implants used may help to elaborate certain requirements, preferences, or trends in implant selection, by surgeon and patients alike. For instance, the volume of the implants used during the first 11 years (1999–2010) was statistically significantly smaller than that of the implants used in the second half of the practice (2011–2022) (Fig. 5A–D; Table 1). Patients prefer and request a larger cup size in southeast England today than in the past. Similarly, there is a gradual rise in the size of the implant requested and used in patients with children when compared with nulliparous patients. The difference and volumes of the implants increased as the number of children increased. The volume chosen or requested by mothers of three or more children was statistically significantly the largest (Fig. 6A–D; Table 2). This can be understood by the physical characteristics of nulliparous patients who generally tend to have firmer and more toned breast, which

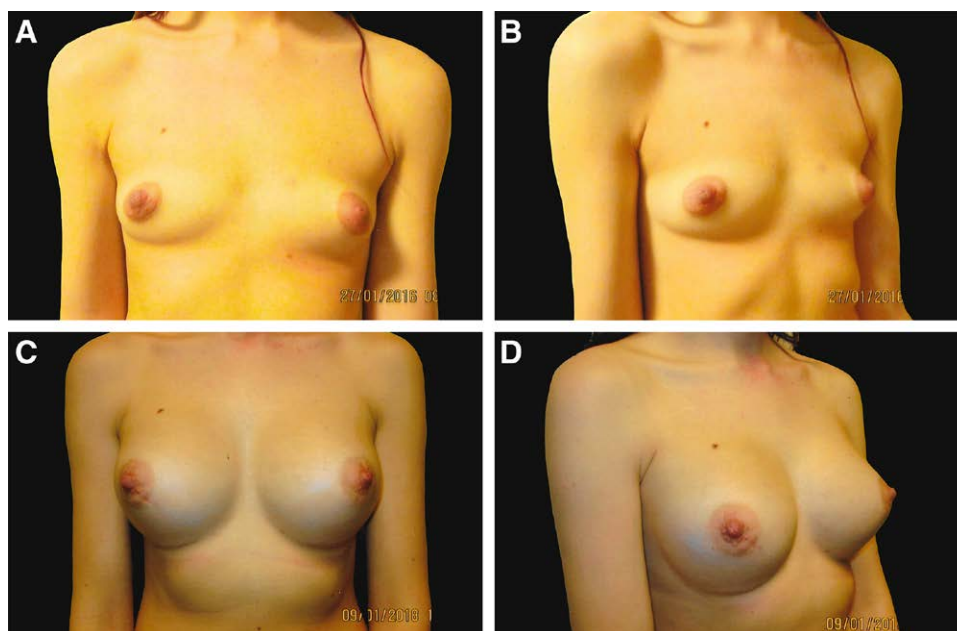


Fig. 5. Breast augmentation in young nulliparous patient. A and B, Preoperative views of a 19-year-old nulliparous patient, who presented with developmental hypoplastic breasts. C and D, Postoperative views showing results 2 years after surgery using 350 cm^3 smooth round silicone gel implants placed in muscle splitting biplane pocket.

Table 1. Table Showing Implant Size Selection on the Basis of Period between 1999 and 2022

	1999–2010	2011–2022	<i>P</i>
	Number (Mean cm ³ ; Range; \pm SD)	Number (Mean cm ³ ; Range; \pm SD)	
Same-size implants	1729 (328 cm ³ ; 200–700; \pm 93.1)	556 (347 cm ³ ; 200–655; \pm 59.9)	0.001
Different-size implants (right)	173 (334 cm ³ ; 220–700; \pm 67.4)	133 (346 cm ³ ; 200–525; \pm 56.9)	0.119
Different-size implants (left)	173 (324 cm ³ ; 200–500; \pm 72.9)	133 (339 cm ³ ; 170–545; \pm 60.3)	0.064

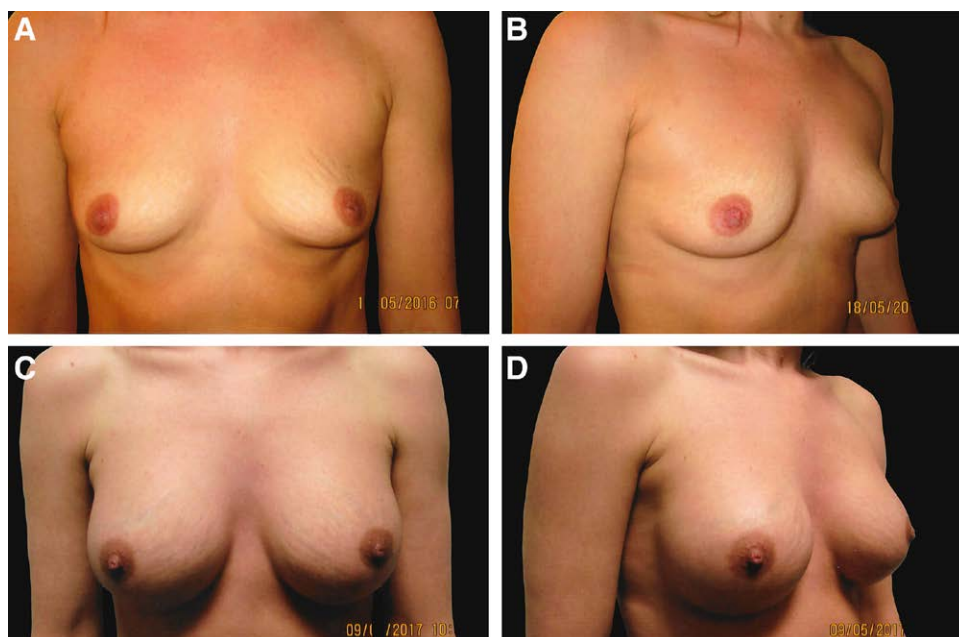


Fig. 6. Breast augmentation in a mother of three children. A and B, Preoperative views of a 29-year-old mother of three children who lost breast volume after childbirth and breastfeeding. C and D, Postoperative views taken 1 year after surgery. She had 325 cm³ textured round silicone gel implants placed in a muscle-splitting biplane pocket.

Table 2. Table Showing Implant Size Selection on the Basis of Age

	Age 18–29 Years	Age 30–45 Years	Age >45 Years	<i>P</i>
	Number (Mean cm ³ ; Range; \pm SD)	Number (Mean cm ³ ; Range; \pm SD)	Number (Mean cm ³ ; Range; \pm SD)	
Same-size implants	1165 (332; 200–615; \pm 52.4)	974 (335; 200–700; \pm 117.8)	117 (327; 205–500; \pm 55.5)	0.226
Different-size implants (right)	180 (335; 200–700; \pm 65.7)	113 (348; 230–525; \pm 57.3)	10 (281; 260–465; \pm 103.0)	0.107
Different-size implants (left)	180 (332; 170–555; \pm 70.4)	113 (333; 200–545; \pm 65.2)	10 (281; 295–400; \pm 59.2)	0.226

are often associated with tight and less stretchable breast skin envelopes for a larger implant. In contrast, a gradual increase in parity is generally associated with relatively more stretchable breast skin due to breast size changes during and following pregnancy. During this period, hormonal changes and breastfeeding can influence breast tissue characteristics as well, which may result in a laxer skin envelope requiring larger implants for an adequate appearance and results. Another factor that may influence the decision of mothers to go for bigger implants following their pregnancy can be due to the hormonal influence and general increase in the size of the breast during pregnancy. This increase is often transient, and

the breast reverts to their prepregnancy size. A larger cup size during pregnancy is often liked by most of the patients as they often refer it to. Interestingly, the current data analysis shows that the size of the implants requested or chosen was not different when different age groups of patients were analyzed. There was not much of a difference when implant volumes selected by these different age groups were analyzed, and the results were not statistically significantly different (Table 3). Even though data analysis showed that there was no statistical difference in implant size selection on the basis of the age, the patients in each group may have a varying number of children. However, patients with children are likely to select larger

Table 3. Table Showing Implant Size Selection on the Basis of Parity or Number of Children

	Patient with No Children	Patient with One Child	Patient with Two Children	Patient with Three Children or More	<i>P</i>
	Number (Mean cm ³ ; Range; ±SD)	Number (Mean cm ³ ; Range; ±SD)	Number (Mean cm ³ ; Range; ±SD)	Number (Mean cm ³ ; Range; ±SD)	
Same-size implants	821 (324 cm ³ ; 200–615; ±50.7)	373 (332 cm ³ ; 220–620; ±57.8)	649 (333 cm ³ ; 205–605; ±51.9)	405 (338 cm ³ ; 200–655; ±58.2)	0.001
Different-size implants (right)	135 (329 cm ³ ; 200–700; ±62.4)	49 (351 cm ³ ; 240–605; ±73)	67 (341 cm ³ ; 230–495; ±53.2)	48 (349 cm ³ ; 200–525; ±62.7)	0.073
Different-size implants (left)	135 (324 cm ³ ; 170–540; ±71.3)	49 (346 cm ³ ; 230–555; ±75.9)	67 (330 cm ³ ; 225–450; ±55.4)	48 (333 cm ³ ; 230–465; ±62.6)	0.355

implants in the same age group. In an ideal scenario, it would have been better to compare different age groups of patients with and without children. Saying that, current study and data analysis can be useful in preoperative discussions and consultations with the patients, but patient's desires, physical characteristics of the breast, surgeon's preferences, and regional trends may still influence the final selection of the implant.

In a study by Hidalgo and Spector,³ implant size selection alone on the basis of sizers inserted before surgery ($276.6 \pm 53.4 \text{ cm}^3$) when compared with the control group ($246.4 \pm 49.5 \text{ cm}^3$) with no sizers showed larger and significantly different ($P < 0.001$) implant size selection in patients who were given a choice. The impact of preoperative volume selection performed by the author, using the Hidalgo method, showed an average implant volume of 346.9 cm^3 (range, 200–700) with a reoperation rate of 1.97%.⁵ When implant volume selection was reported purely on the basis

of tissue characteristics, the volume selected was 289 cm^3 (range, 150–500).² The use of three-dimensional imaging for implant size selection and implant sizers used for breast cup size simulations showed the methodology as one of the top two useful methods for implant size selection. The computer simulation to generate a three-dimensional image using Crisalix (Crisalix Virtual Aesthetics, Lausanne, Switzerland) was found to be very (78%) or rather (15%) accurate. The same study showed that 88% patients felt it played an important role in decision-making.¹⁷

Implant selection can be challenging in patients with observed breast and chest asymmetries, with breast volume and chest or rib projection differences of 46% and 8.6% respectively, and implants of different sizes were used in only 9% of the patients¹⁸ (Fig. 7). A reoperation rate of 15% has been reported, with implant size or profile change being one of the reasons.^{5,19} The current study aimed to add information for the preoperative consultation

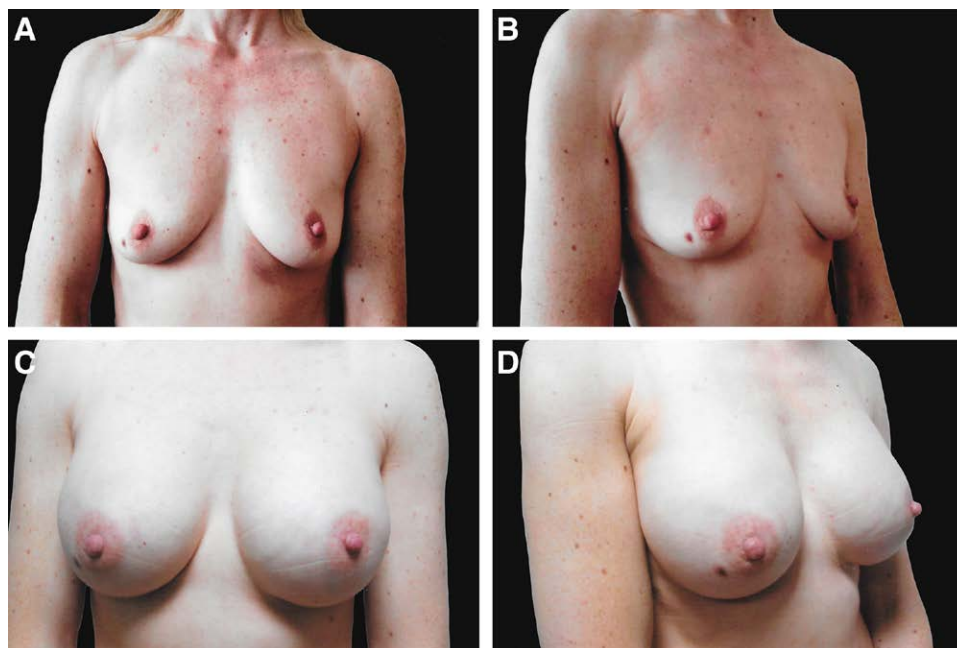


Fig. 7. Breast augmentation in a middle-aged patient. A and B, Preoperative views of a 51-year-old patient and mother of three children who lost volume and shape of her breast due to aging process. C and D, Postoperative views taken 1 year after surgery. The patient had 230 cm^3 on her right larger breast and 260 cm^3 on her left smaller breast. She had textured, moderate profile, round silicone gel implants placed in a muscle-splitting biplane pocket.

process. Patients with small differences, especially if they have not noticed differences before consultation, are not generally keen to have their minor asymmetries corrected. It is best for surgeons not to impose their own observations, and the author prefers to leave the final word to the patients, unless it is felt that it is imperative to stress the importance for the correction or improvement of the difference when an opportunity is at hand. An Australian and New Zealand multicentre study used a modified Delphi method for implant size selection, and the study recommended suggestions based on patient and implant-based characteristics; however, the implant volume used or selected was not part of the study.¹² Dr. Baker described his experience with implant volume selection on the basis of patient body mass index and recommended 150 cm³ for a cup size increment or 175–200 and 200–225 cm³ for a medium frame with medium chest wall width and a large patient frame, respectively. He often used templates and calipers as secondary tools to assist his implant volume selection. He also noted a difference in implant volume selection from 200–235 cm³ in the early part of his practice in the 70s to 325–400 cm³ 30 years later; however, the article did not include the overall mean volume of the implant selected or used, especially on the basis of the age of the patient or her parity.²⁰

Weaknesses and Strengths of the Study

The current study is limited to implant volume selection where implant base width and tissue characteristics were taken into account, and breast implants were used in bras for cup size simulations and stratified on the basis of age, parity, and period. The data analysis is based on an individual surgeon's practice and may potentially be influenced by personal experiences or preferences. The study might have given additional information if the implant size selection would have been based on the number of children within a specific age group. Similarly, whether increased number of children at an early age would have made a difference when compared with the patients who had the same number of children at a later stage of their lives might have yielded more interesting information. The current study is also limited to the Hidalgo method of implant size selection, which is a combination of objective findings and subjective desires.³ It is possible that implant size selection, entirely based on Tebbett tissue-based algorithm, may have different results as to the one observed in the current study.⁴ However, the large size of the sample in this study is expected to establish certain trends and inclinations for implant size selection by the patients based on period, parity, and age.

CONCLUSIONS

Implant volume selection can be based on various methods based on an individual surgeon's experience; however, breast width and tissue characteristics remain the vital gold standard. Within the available parameters, the patient's choice must be respected where possible.

There were variations in the pattern of implant volume selections between the first half of the practice and the second half of the practice. It was noted that in this particular practice, patients request a larger implant volume for larger cup sizes, and the result was statistically significant. There was also a pattern where nulliparous patients had smaller implants than patients who had children, and the greater the number of children, the larger the volume of implants used. The results were statistically significant in this group as well. There was no difference in implant volume used when patient data were analyzed on the basis of their ages.

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DISCLOSURE

The author has no financial interest to declare in relation to the content of this article.

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