Editorial

Hybrid breast augmentation: a surgical approach and formula for preoperative assessment of fat graft volume

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Breast augmentation is a popular elective cosmetic surgery, and innovations in implant technology and surgical methods have driven down complications and improved patient satisfaction over the past 20 years. As techniques progress, surgeons are guided by the perceived needs and trends of breast aesthetics, and recently the popularity of a natural breast aesthetic has caused an influx in the number of women seeking autologous fat grafting (AFG) for breast contouring.

AFG was originally discouraged by the American Society of Plastic Surgeons in 1987 as it was thought this could skew the interpretation of breast imaging, with the primary concern of delaying the diagnosis or recurrence of breast cancer (1). Despite this concern and a recent systematic review reiterating this issue, the surgical community has largely dismissed the problem as the popularity of naturally appearing breasts becomes of interest to women who seek a natural augmentation (2,3). A larger problem plaguing surgeons is rather the volume of fat that becomes reabsorbed post-AFG, which drives down satisfaction and can even distort breasts more as reabsorption becomes asymmetrical between breasts. The rates of fat volume reabsorption vary from person to person, but a recent systematic review purports this number ranges from 37% to 80%. Some studies reported the use of auxiliary methods like platelet-rich plasma, stromal vascular fraction, and administration of cell-stimulating hormones like insulin and erythropoietin are useful for reducing fat reabsorption (4) but still this does not completely halt reabsorption. This is concerning to patients who undergo initial transformations only to be disappointed months post-operation.

With this concern in mind, hybrid breast augmentation (HBA) was invented by Auclair *et al.* (5) as a means of increasing volume while maintaining a natural look. The method includes the insertion of relatively smaller implants which are supplemented by AFG (5). Such a method has become popularized among young people, as it increases the capacity for breastfeeding and gives the appearance of naturally lifted breasts which may be difficult to achieve in AFG. Concerning radiological findings also common in AFG such as calcifications, hematomas, and fat necrosis, are less common in HBA (6). The surgery also confers to high satisfaction rates for patients, with Trignano *et al.* having 100% satisfaction on Breast-Q questionnaire across 122 patients when HBA was implemented using a subfascial plane and silicon implant (6).

The HBA technique allows for slimmer individuals to obtain a natural-appearing breast contour similar to

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AFG, without the abundant fat required to supplement the volume necessary for a sufficient graft. It is not uncommon in fat grafting procedures for women to gain weight even intentionally to improve the volume available for procedures, which unnecessarily puts patients at risk of diabetes, cardiovascular diseases, and unhealthy habits. For studies using HBA mean body mass index (BMI) can be relatively normal, and oftentimes underweight. For example, the mean BMI for Trignano *et al.* was overweight at 26 kg/m^2, but for Auclair *et al.* (7), and Munhoz *et al.* 2021 (8) this was 18.9, and 18.8 kg/m^2, respectively. Underweight BMI inevitably led to lower grafted volume, with Maximiliano *et al.* (9) liposuctioning a mean of 79.23 mL compared to Trignano *et al.* who liposuctioned 150 mL. *Table 1* summarizes the basic characteristics of HBA studies from a focused search of PubMed, Web of Science, Cochrane Library, and Google Scholar databases (5-14).

With an essential component of AFG being the optimal amount of fat harvest volume that also allows for the greatest volume retention, several equations have been derived to optimize this balance for HBA. Originally, Maximiliano *et al.* derived the statement:

$$V_{AFG} = \left(\pi \times r^2 \times p\right) / 4.8 \quad [1]$$

Where 'r' represents the radius and 'p' represents the equation of $V_F = V_B + V'_A$, in which 'V_F' represents the final volume of the breast which is the sum of 'V_B' (initial breast volume) and 'V_A' (the augmentation volume) (9). Later, Trignano *et al.* believed the hybrid implant volume would be ideal after the combination of the half-through implant (I_v) and half-through AFG (F_v), $V_A = I_{v(50\%)} + F_{v(50\%)}$. By observing half of the harvested fat would be reabsorbed (F_R), this led to development of the equation $F_V = F_r + F_R = \frac{1}{2} F_H$, where ($F_H$) is the harvested fat and (F_r) is the reabsorbed amount of fat. The final equation of augmented AFG volume (V_A) was then said to be:

$$V_A = I_{v(50\%)} + \frac{1}{2} F_H \quad [2]$$

Trignano *et al.*'s equation also confers to a higher volume of grafted fat, which inevitably led to better satisfaction. Seth *et al.* demonstrated that Breast-Q is a validated patient-reported outcome tool (15), and Trignano *et al.* found a higher rate of satisfaction than Maximiliano *et al.* even with the use of smaller implants (6,9). Their study found 100% of patients were very satisfied after one year of follow-up, however the anthropometrics of his patients also allowed for larger fat volume injections (BMI: 26 kg/m^2). On the other hand, those with underweight BMI such as Maximiliano *et al.*, Munhoz *et al.* [2021], and Munhoz *et al.* [2022] conferred less satisfaction (96.6%, 95.2%, and 94.5% very satisfied or satisfied, respectively), while 3.3%, 4.7%, and 5.4%, were partially disappointed (8,9,11). For physicians, HBA is also a satisfying procedure, with Sforza *et al.* (10) concluding 84.5% of surgeons reported high levels of satisfaction, while 13.3% reported good levels and 4.2% reported fair levels.

Credit to AFG uprising popularity purporting to achieve a natural appearing contour with low complication rates. The Trignano *et al.* authors identified the challenges of HBA with the volume of fat harvested to achieve desired aesthetic results. Despite the authors study demonstrating a high patient satisfaction rate, there were 13 cases (in 10.65% of cohort) of complications noted, of which most were minor including hypertrophic scarring, seromas, and hematomas. Therefore, HBA performance demonstrated to reduced well-known AFG complications related to sensory or aesthetic changes and may provide advancements from Maximiliano *et al.*'s study.

Despite providing meaningful results by Trignano *et al.*, it does have limitations. Firstly, the study's retrospective design with no inclusion or exclusion sample size criteria and the time frame and follow-up duration was relatively small for complications. Secondly, the same implant type of Motiva SmoothSilk/SilkSurface implants (ergonomics, high projection) was used and the implant size was smaller than commonly used (16). Lastly, the BMI ranged from 21–30 kg/m^2 with a mean of 26 kg/m^2, hence there was a lack of data on underweight weight patients, which this technique may not be appropriate.

In summary, HBA is an effective means for the breast augmentation. Despite demonstrating high complication rates, most of them were minor and patient satisfaction remained high. The authors state an optimal fat augmentation equation which may assist plastic surgeons in optimizing the ideal shape for their patients. However due to the limitations of the study, further large-scale studies comparing different fat grafting techniques with long-term follow-ups are needed for definitive clinical management.

Table 1 Previous HBA studies

Study ID	Number of patients	Number of breasts	Age (years)*	BMI (kg/m^2)*	Implant volume (cc)*	AFG harvest volume (mL)*	AFG grafted volume (per breast) (mL)*	Implant base diameter (cm)*	Implant projection (cm)*	SN-N (cm)*	N-IMF*	IM (cm)*	Complications, n (%)	Conclusions
Trignano *et al.*, 2022 (6)	122	244	43 (7.77)	26 (1.50)	170 (17.50)	600 (40.00)	150 (10.00)	–	–	19.4 (0.83)	6.7 (0.43)	4.2 (0.52)	Hypertrophic scarring 5 (4.09%) Wound dehiscence 3 (2.46%) Hematomas 3 (2.46%) Seroma 1 (0.82%) Fat necrosis 1 (0.82%) Bilateral hypertrophic scarring was observed 1 (0.82%) Monolateral hypertrophic scarring 3 (2.46%)	Our study showed a low rate of complications and reduced operative and recovery times. Our mathematical formula, used to calculate the volume of fat that needs to be injected, seems to be validly predictive and a precise guide for surgical decision-making in planning the treatment of thin patients who are candidates for HBA because of hypomastia. Globally, the analysis of Breast-Q© questionnaires showed a high grade of satisfaction among patients, proving the validity both of our surgical technique and our formula Further investigations should be performed to study a wider population and different type of implants
Maximiliano *et al.*, 2020 (9)	30	60	33.3 (6.50)	24.1 (2.50)	278.17 (40.00)	265 (51.25)	79.23 (15.00)	10.53 (0.56)	4.31 (0.23)	18.5 (0.75)	6.5 (0.65)	4 (0.68)	Subcutaneous banding in the axilla 2 (6.6%) Minor wound dehiscence and hypertrophic scarring at the axillary incision 1 (3.3%) Localized unilateral hypertrophic scar 1 (3.3%)	The AFG volume required for grafting in hybrid BA can be reliably calculated utilizing simple measurements based on implant volume and projection. This low-cost method for assessing AFG volume via a mathematical equation can be used to guide surgical decision-making in treating thin patients with hypomastia who candidates for HBA are. Our experience thus far shows that this equation permits the surgeon to perform hybrid BA with SmoothSilk implants in a simple, reproducible, and more precise manner
Auclair *et al.*, 2013 (5)	197	394	–	–	259 (116.00)	320 (308.00)	–	–	–	–	–	–	Cystic mass 2 (1.05%) Capsular contracture 1 (0.52%) Additional fat grafting required 5 (2.63%)	Breast augmentation with simultaneous implants and fat affords a more powerful and versatile approach and achieves a synergistic outcome. Composite breast augmentation should be added to the list of applications where fat grafting to the breasts may have clinical utility beyond simple core volume enhancement
Auclair *et al.*, 2015 (7)	190	199	35 (9.33)	18.9 (1.00)	270 (116.67)	550 (308.33)	125 (25.00)	–	–	–	–	–	Capsular contracture 2 (1.05%) Additional fat grafting required 9 (4.74%)	CBA is a safe and reliable procedure, with excellent long-term results. These postoperative outcomes are maintained over several years. Patient satisfaction is high, not only with the augmentation result but also with the concomitant liposuction that is required for fat harvesting
Sforza *et al.*, 2021 (10)	52	104	27 (3.86)	–	–	–	113.63 (19.70)	–	–	–	–	–	Infections 1 (1.9%)	The procedure presented consistent and reproducible results. HBA can help design a pathway for a future with breasts free of silicone. This information is particularly relevant for women who have their first breast augmentation at an early age and will probably have 2 to 5 additional surgeries in their lifetime due to the nature of current silicone breast technology
Munhoz *et al.*, 2021 (8)	42	84	34.6 (7.00)	18.8 (2.93)	–	380	–	–	–	–	–	–	Axillary subcutaneous banding 3 (7.1%) Hypertrophic scars 1 (2.3%) Wound dehiscence 1 (2.3%) Hematoma 1 (2.3%) Capsular contracture 1 (2.3%)	The SEAH approach, combined with recent progress in surgical techniques and new-generation implants, can improve aesthetic outcomes following BA, and our results demonstrate it to be a consistent procedure. Even so, important technical steps must be planned before surgery. Preoperative patient evaluation is crucial to evaluate the indications, select proper volumes for the implant and AFG, and define pocket dimensions, as is careful intraoperative management. When combined with clinical expertise, this evidence will help surgeons achieve safer aesthetic outcomes from BA
Munhoz *et al.*, 2022 (11)	38	76	30.47 (6.13)	22.53 (2.36)	–	303.68 (73.20)	201.6 (42.34)	10.5 (0.47)	4.1 (0.35)	–	–	–	Axillary subcutaneous banding 1 (2.6%) Hypertrophic scars 1 (2.6%) Wound dehiscence 1 (2.6%)	Recognizing risky cleavage breast zones between the implant pocket and the upper and medial quadrants remains essential to attain satisfactory outcomes. Although experience and proper judgment are still important in the fat grafting technique, the data presented here offer plastic surgeons an additional standardized framework to help deliver predictable HBA
Maione *et al.*, 2018 (12)	31	62	34.3 (12.40)	–	–	–	–	–	–	–	–	–	–	Our observations show that the combination of high-profile round implants and fat grafting in aesthetic breast augmentation can improve the aesthetic outcome and patient satisfaction as with anatomical implants eliminating the risk of implant rotation

Table 1 (*continued*)

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Study ID	Number of patients	Number of breasts	Age (years)*	BMI (kg/m^2)*	Implant volume (cc)*	AFG harvest volume (mL)*	AFG grafted volume (per breast) (mL)*	Implant base diameter (cm)*	Implant projection (cm)*	SN-N (cm)*	N-IMF*	IM (cm)*	Complications, n (%)	Conclusion
Kerfant *et al.*, 2017 (13)	156	–	31.7 (5.33)	18.85 (1.50)	252 (54.17)	457 (406.60)	126 (36.67)	–	–	–	–	–	Capsular contracture 6 (4.56%) Hematoma 2 (1.28%) Infection 2 (1.28%) Rotation 1 (0.64%) Palpable/visible implant edge 3 (1.92%) Volume augmentation 3 (1.92%) Asymmetry 1 (0.64%)	Composite breast augmentation is a valuable, stable, reliable technique in breast aesthetic surgery with good, natural appearing results. It provides long-term aesthetic benefits and avoids the submuscular plane
Shi *et al.*, 2019 (14)	11	22	32.5 (8.13)	–	211.82 (15.56)	–	104.32 (29.50)	–	–	–	–	–	Decrease in the sensation of a unilateral nipple-areola 1 (9.09%)	Breast augmentation combining autologous fat and prosthesis was safe and could achieve aesthetically satisfactory results

*, data are in mean (SD). HBA, hybrid breast augmentation; SD, standard deviation; BMI, body mass index; AFG, autogenous fat grafting; SN-N, sternal notch-to-nipple distance; N-IMF, nipple to the inframammary fold; IM, intermammary distance; BA, breast augmentation; CBA, composite breast augmentation; SEAH, subfascial ergonomic axillary hybrid.

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Footnote

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