abdominis musculocutaneous flap and the left breast with a deep inferior epigastric perforator flap. The postoperative course was uncomplicated and she was discharged on the sixth day. Pathologic examination demonstrated extensive fibrosis, chronic inflammation, and a foreign body giant cell reaction in the 2.48- and 2.46-kg specimens. Further surgery was performed at 5 months for scar revision and nipple-areola reconstruction, with favorable aesthetic results 11 months later (Fig. 2).

Pumping has been around for decades in countries outside the United States, but U.S. Food and Drug Administration approval exists for the use of liquid silicone only in treating retinal detachment. However, early clinical studies under U.S. Food and Drug Administration supervision by Edgerton and Wells demonstrated safe, consistent results when using low-volume injections for facial soft-tissue augmentation.[4] Its use came with the caution of never injecting the breast, buttocks, or vascular spaces, or large quantities.

Misconceptions regarding the safety of injecting liquid silicone persist, and pumping remains a popular form of body modification. Plastic surgeons may need to use complex reconstructive options to provide a balance between reconstruction and aesthetics in patients who have created complicated surgical fields.

The caution against injecting liquid silicone is worth repeating, as devastating results continue to be seen. As civil and legislative rights of transgender individuals are increasing, the rate of those seeking medical treatment has grown at 14 percent per year in Europe.[5] Reconstructive surgeons may see an increase in patients requiring complex reconstructions to correct the catastrophic consequences of poorly performed aesthetic surgery while maintaining the patient's primary aesthetic goals. It is up to all health care providers to educate patients about the complications of these dangerous procedures and direct them to qualified providers.

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Percentage Augmentation: The More Meaningful Index of Success in Fat Grafting

Sir:

A meaningful comparative measure of success in autologous fat transfer is much needed. The current popular yardstick is percentage graft retention: final volume augmented/initial volume grafted. We hereby argue that percentage graft retention lacks clinical significance and should be replaced by the more clinically relevant percentage augmentation: final volume augmented/initial recipient-site volume.

First, percentage graft survival is not related to the quality of the fat graft, the recipient site, or the surgical technique; it mostly relates to the ratio of graft volume to graftable recipient space. As an example, diffusely, evenly, and carefully grafting 10 ml of fat into a 100-ml recipient site as individual microdroplets[1,2] that do not coalesce might well lead to a 90 percent graft survival rate but only increase the volume of the new construct by 9 percent: an impressive 90 percent graft retention, but only a 9 percent augmentation.[3,4] If, in contrast, the same surgeon were to use the very same fat preparation and the very same grafting technique in attempting to graft 200 ml into the very same 100-ml recipient breast, the new construct would triple in volume. This would overfill the recipient, choke the microcirculation, and result in very little graft retention or even possible necrosis.[5] These would be different outcomes, yet everything was the same except the judgment of the surgeon who failed to recognize the graft-to-capacity ratio.[6]

Second, not all reinjected fat is the same. Some surgeons concentrate the lipoaspirate with over 1000-*g* centrifugation, whereas others simply allow it to sediment at 1 *g* and reinject it as a large-volume slurry. To further complicate the issue, others distill out the most active ingredients, discard the rest of the harvested fat, and reinject a very small volume.[2,7] With no agreement on what should be the denominator, percentage graft

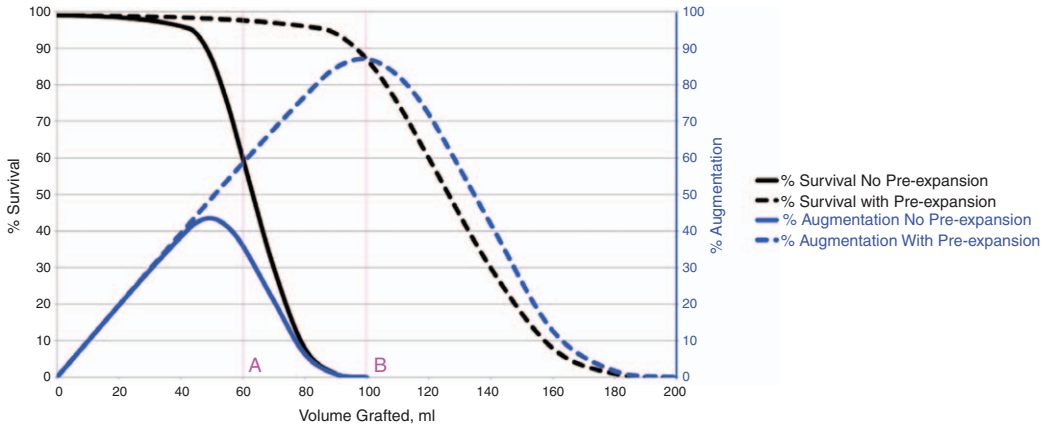

Fig. 1. Hypothetical plot of fat grafting a 100-ml recipient breast showing the variation of percent survival and percent augmentation as the graft volume increases. With low graft volumes, survival percentage is high while augmentation percentage is low. Grafting the recipient up to its peak capacity (50 ± 20 percent, depending on tissue laxity) yields the highest augmentation, while survival might remain high. Beyond this peak, however, grafting is counterproductive. It overfills the recipient beyond its capacity and leads to rapid loss of both percentage survival and augmentation. Surgeons tend to overgraft and report 50 to 70 percent survival with 30 to 40 percent augmentation (*point A*) (Spear SL, Pittman T. A prospective study on lipoaugmentation of the breast. *Aesthet Surg J*. 2014;34:400–408). However, after external expansion, which temporarily doubles the recipient to 200 ml, peak capacity also doubles to 100 ml. Grafting 100 ml now yields nearly 90 percent survival and nearly 90 percent augmentation (*point B*) (Khouri RK, Khouri RK Jr, Rigotti G, et al. Aesthetic applications of Brava-assisted megavolume fat grafting to the breasts: A 9-year, 476-patient, multicenter experience. *Plast Reconstr Surg*. 2014;133:796–807; discussion 808).

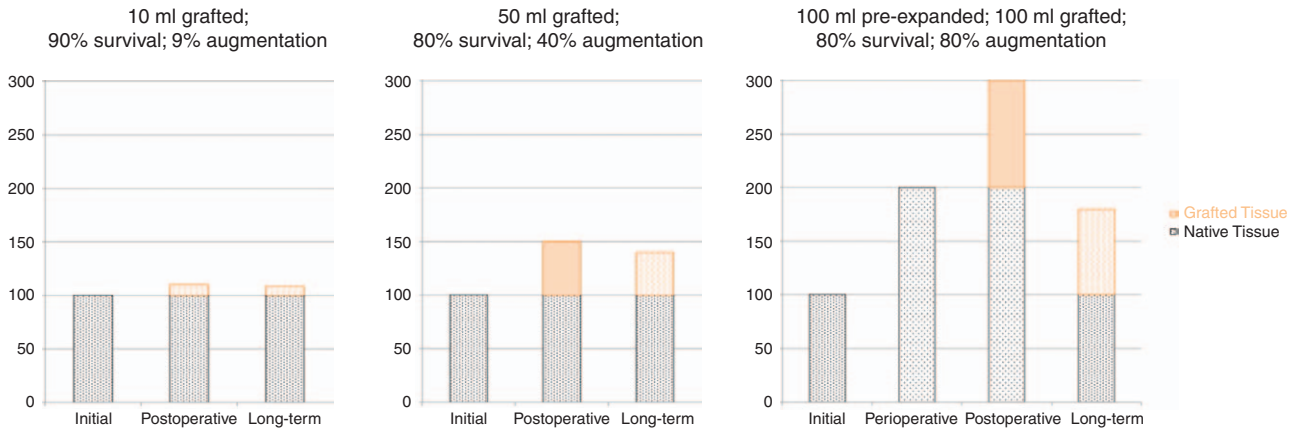

Fig. 2. Outcome measures in three approaches to autologous fat transfer. (*Left*) By diffusely grafting only 10 ml of fat into a relatively large 100-ml recipient site, the surgeon can achieve 90 percent survival but only 9 percent augmentation. (*Center*) Using the same technique to graft 50 ml of fat into the same 100-ml recipient site, the surgeon can achieve 80 percent survival and 40 percent augmentation (numbers adapted from Spear SL, Pittman T. A prospective study on lipoaugmentation of the breast. *Aesthet Surg J*. 2014;34:400–408, and the literature). (*Right*) External expansion temporarily doubles the recipient site, so the surgeon can use the same technique to graft 100 ml of fat into the recipient site without overcrowding (Khouri RK Jr, Khouri RE, Lujan-Hernandez JR, Khouri KR, Lancerotto L, Orgill DP. Diffusion and perfusion: The keys to fat grafting. *Plast Reconstr Surg Glob Open* 2014;2:e220). The surgeon can still achieve 80 percent survival, but the long-term augmentation is now 80 percent of the original volume (numbers adapted from reports using preexpansion) (Khouri RK, Eisenmann-Klein M, Cardoso E, et al. Brava and autologous fat transfer is a safe and effective breast augmentation alternative: Results of a 6-year, 81-patient, prospective multicenter study. *Plast Reconstr Surg*. 2012;129:1173–1187; and Khouri RK, Khouri RK Jr, Rigotti G, et al. Aesthetic applications of Brava-assisted megavolume fat grafting to the breasts: A 9-year, 476-patient, multicenter experience. *Plast Reconstr Surg*. 2014;133:796–807; discussion 808).

survival is not standardized and cannot be a useful measure of success.

Third, large-volume autologous fat transfer is about volume increase; this is the most pertinent clinical outcome. However, increasing by 100 ml a 100-ml mastectomy defect or AA recipient breast doubles the original recipient volume (100 percent augmentation) and is a much more formidable achievement than increasing by the same 100 ml a 2000-ml buttock recipient (5 percent augmentation). Therefore, absolute volume increases cannot be used as a measure of surgical prowess or quality of injected fat.

Fourth, assuming all the augmented volume is live fat, the most striking achievement in autologous fat transfer is by how much a defined recipient volume can further increase in volume. This percentage augmentation is the real clinical challenge and is the most relevant measurement of proficiency in autologous fat transfer. The best-documented report on autologous fat transfer breast augmentation without preexpansion by Spear and Pittman had a 40 percent augmentation.[8] A meta analysis of published autologous fat transfer breast augmentation, including reports of stem cell supplementation, had a 35 percent augmentation.[9] By meticulously grafting droplets of fat as a fine mist that maximizes the graft-to-recipient interface, it seems possible to enlarge a recipient site by 35 to 40 percent. In contrast, reports of Brava (Brava, LLC, Miami, Fla.) plus autologous fat transfer breast augmentation showed an 80 percent[9] and, as we got better, a 90 percent augmentation.[10] Temporary expansion of the recipient to double or even triple its size before autologous fat transfer has proven to be the best way of increasing the effective augmentation ratio (Figs. 1 and 2). Despite all the available technology, just doubling the size of a recipient site with healthy fat remains a formidable clinical challenge.

The most popular yardstick of prowess in autologous fat transfer, percentage graft survival, is mostly an indication of how much the surgeon has overgrafted or undergrafted a recipient site. It says nothing about the effective augmentation and has little clinical relevance. We plead with future generations of authors to replace their reports of percentage graft survival with the much more clinically relevant percentage augmentation of a specific recipient site.

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Severe Traumatic Facial Injury: Avatars and Thermographic Damage Evaluation

Sir:

An ideal method for evaluating facially disfigured patients should combine morphologic analysis and dynamic evaluation. We analyzed a 17-year-old male patient with sequelae of facial trauma caused by a motorcycle accident (Fig. 1). He underwent multiple reconstructive procedures, but a disfigured face remains and further operations are needed.

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