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Underestimating Implant Volumes in Cosmetic Breast Augmentation

Eric Swanson, MD

The first question to ask in determining implant size is, who makes the choice? It would seem obvious that the patient decides. However, some plastic surgeons believe it is their responsibility to educate their patients about the alleged dangers of large implants and talk them down,[1] a practice I have called paternalistic.[2] Mallucci and Branford[1] warn of serious consequences of large breast sizes, including bottoming out and double bubbles. Like Adams,[3] Mallucci's average implant size is about 290 cc; he considers 400 cc implants, his maximum, "huge" (personal communication, March 2, 2017). Tebbetts[4] also believes that implant sizes should generally be under 350 cc. On the other hand, many experienced surgeons insert implants with average volumes in the range of 390–438 cc.[2,5,6] Who is correct?

The second question to consider is whether large implants cause more complications. In my clinical study, there was no correlation between implant size and complications.[5] Patient surveys showed a positive correlation between implant size and result ratings.[2] Huang et al.[6] found that women with implant volumes of 300–350 cc returned for more reoperations than those with implant volumes greater than 350 cc.

The High Five system linearly relates implant volume to the base width.[7] A woman with a base width of 10.5 cm receives a 200 cc implant and a woman with a 15.0 cm base width is assigned a 400 cc implant.[7] The problem is implant volume is related exponentially (r^3), not linearly, to diameter (Fig. 1). This geometric fact means that a woman with a base width of 15.0 cm should receive a 600 cc im-

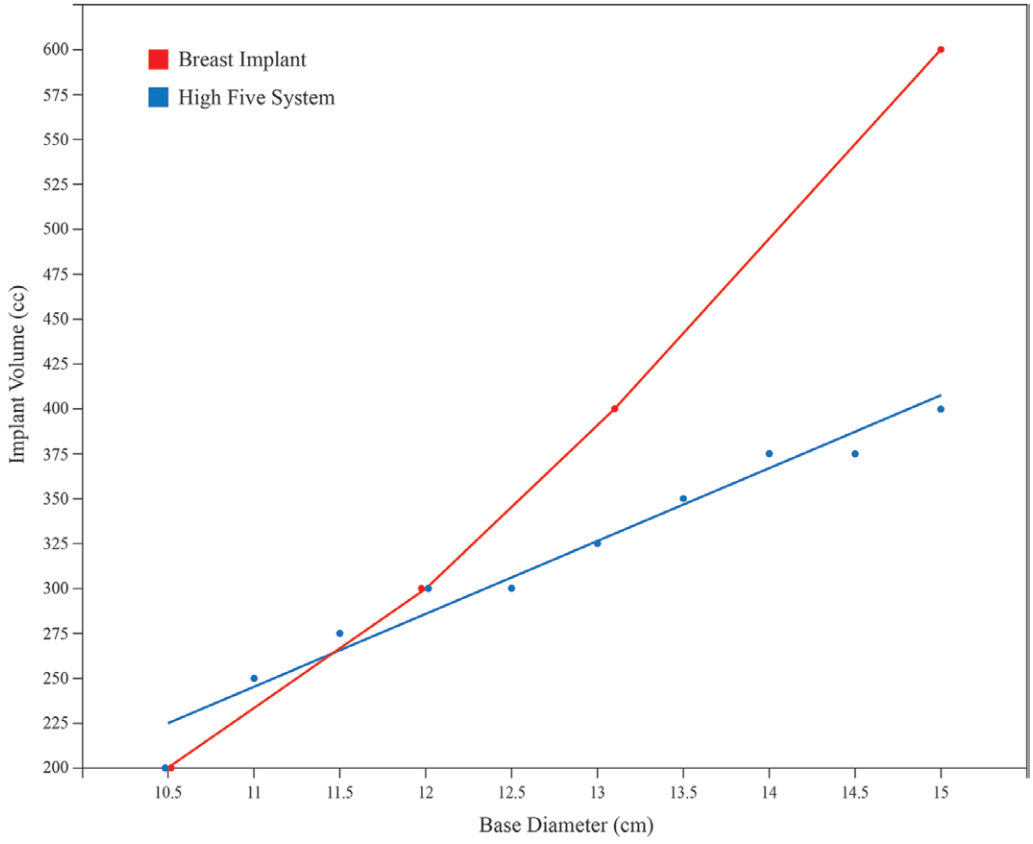

Fig. 1. Base diameter versus implant volume. The High Five system (blue) linearly relates the proposed implant volume to the base width. By comparison, breast implant volume increases exponentially, to the third power, with increasing diameter. The breast implant measurements (red) are for a smooth, round MemoryGel implant with a Moderate Plus profile (Mentor Corp., Santa Barbara, Calif.). However, the same exponential increase in volume compared with diameter applies to any breast implant.

From the Swanson Center, Leawood, Kans.

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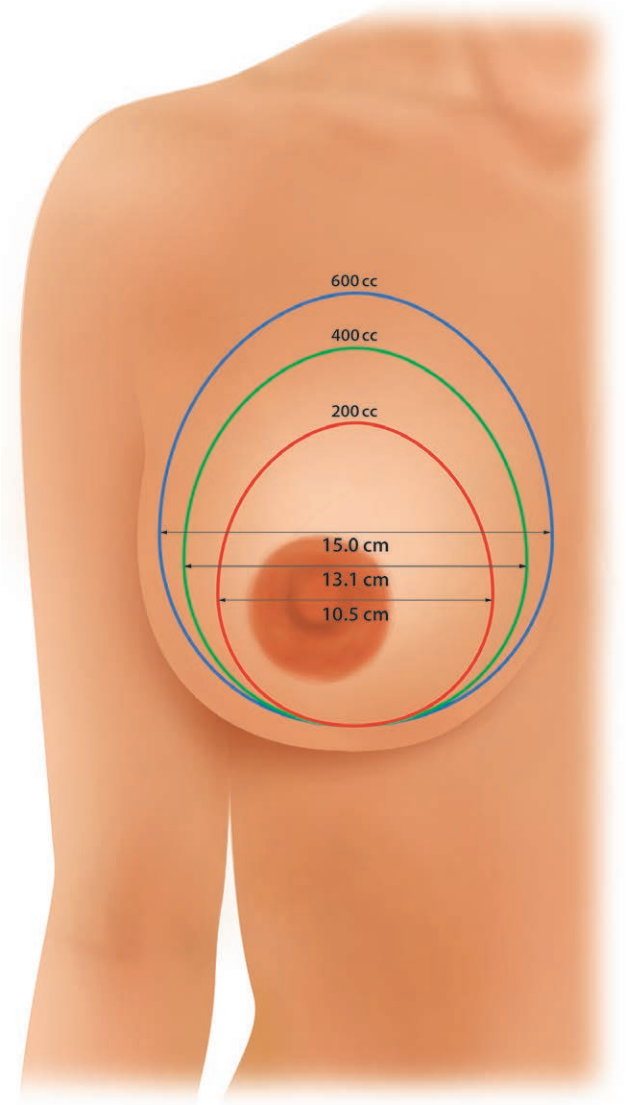

Fig. 2. Illustration depicting breast implant volumes and diameters. As the implant volume increases from 200 to 400 cc and to 600 cc, the diameter increases at a slower (in fact, decreasing) pace, from 10.5 cm to 13.1 cm to 15.0 cm. The implants are placed at the same level above the inframammary ligaments to reduce the risk of bottoming out. The breast implant dimensions represent a smooth, round MemoryGel implant with a Moderate Plus profile (Mentor Corp., Santa Barbara, Calif.), although the same geometrical relationship between diameter and volume exists for any breast implant. This illustration does not take into account the normal tissue stretching and implant settling that occur after implantation.

plant to maintain the same breast proportions as a woman with a 10.5 cm base width.

Similarly, tissue-based planning linearly relates the level of the inframammary incision to implant volume.[7] Implant surface measurements are related exponentially ($1/r^3$) to volume. Consequently, a linear equation is likely to site the new inframammary fold level too low. The High Five system locates the incision 9.5 cm below the nipple when inserting a 400 cc implant.[7] If a supra-inframammary fold approach is used for implants of all sizes (Fig. 2), preserving the inframammary ligaments, the risk of implant malposition, bottoming out, and double bubbles is minimized. Indeed, large implants (> 400 cc) may be blamed when inferior overdissection is the real problem.

Bra sizing also tends to underestimate implant volumes (average, 246 cc).[2] Computer simulations are not yet reliable because they are not based on actual breast measurement data and therefore inaccurately represent changes in breast dimensions.

So where does this discussion leave us? Not surprisingly, calculating implant sizes without regard for patient size preference using a linear system[7] leaves many patients (at least 20%[3]) with smaller breasts than they desire. Experienced plastic surgeons often show before-and-after photographs of other patients with similar breasts and gather their patient's input, without tissue measurements, bra sizers, or computer simulations. As Winston Churchill might have phrased it, "it is the worst possible way to select implant size, except for the alternatives."

Eric Swanson, MD
Swanson Center
11413 Ash Street, Leawood, KS 66211
913 663-1030
E-mail: eswanson@swansoncenter.com

DISCLOSURE

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REFERENCES

1. Mallucci P, Branford OA. Reply: design for natural breast augmentation: the ICE principle. *Plast Reconstr Surg.* 2017;139:801e–802e.
2. Swanson E. Prospective outcome study of 225 cases of breast augmentation. *Plast Reconstr Surg.* 2013;131:1158–1166; discussion 1167–1168.
3. Adams WP Jr. The process of breast augmentation: Four sequential steps for optimizing outcomes for patients. *Plast Reconstr Surg.* 2008;122:1892–1900.
4. Tebbetts JB. The greatest myths in breast augmentation. *Plast Reconstr Surg.* 2001;107:1895–1903.
5. Swanson E. Prospective comparative clinical evaluation of 784 consecutive cases of breast augmentation and vertical mammaplasty, performed individually and in combination. *Plast Reconstr Surg.* 2013;132:30e–45e; discussion 46e–47e.
6. Huang GJ, Wichmann JL, Mills DC. Transaxillary subpectoral augmentation mammaplasty: a single surgeon's 20-year experience. *Aesthet Surg J.* 2011;31:781–801.
7. Tebbetts JB, Adams WP. Five critical decisions in breast augmentation using five measurements in 5 minutes: the high five decision support process. *Plast Reconstr Surg.* 2005;116:2005–2016.