



Update on Body Shaping and Volume Restoration: The Role of Hyaluronic Acid

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Abstract After the introduction of facial aesthetic injectables with botulinum toxin (BoNt) in the first half of the 1990s and nonanimal-based hyaluronic acid (HA) fillers in 1996, the interest for minimally invasive procedures has exploded. With this background, it is not surprising that the interest for body contouring with HA has also attracted a lot of interest. The effectiveness and safety for breast augmentation, buttock augmentation and treatment for pectus excavatum has been extensively investigated and published. Generally, patient satisfaction has been high and complications low. Due to several factors such as limited duration and unfavorable cost, HA fillers have been withdrawn from the market. With the development of new HA products, it is possible that its use for body contouring will be reintroduced and popular in the future.

Keywords Breast augmentation · Fat grafts · Hyaluronic acid · Implants · Injectable fillers

Introduction

Since this article [1] was published in 2009, considerable changes in volume restoration techniques have occurred. This is true for both facial and body shaping. It is interesting to note that since 2009, this initial publication on the

use of hyaluronic acid for volume restoration in the body has been one of the most cited articles in the APS Journal. This is paralleling the extremely fast growth of minimally invasive techniques which exceed the growth of surgical procedures considerably. With the introduction of aesthetic treatments with botulinum toxin (BoNt) in the first half of the 1990s and nonanimal-based hyaluronic acid (HA) fillers in 1996, the interest in minimally invasive procedures has exploded. The reason for this is that they offer several benefits compared to surgical interventions:

- Can be performed with, and frequently even without, local anesthesia.
- Do not require hospitalization.
- Usually have minimal recovery times.
- Achieve rapid results, with less apparent and dramatic change.
- Injectable materials such as BoNt and hyaluronic acid fillers are well tolerated.
- Results of these types of injectables are not permanent and also reversible.
- In some areas, the duration may be very long lasting (e.g., by stimulation of natural collagen production).
- Are less costly and short term.
- Have less risk for complications.
- Leave now revealing scars, deformities or pigmentary changes.

With this background, it is not surprising that the interest in body contouring with HA has attracted a lot of interest. After this 2009 initial publication, a number of scientific investigations were undertaken investigating the use of HA (Macrolane®, Qmed/Galderma Co). The first ones of these investigated the effectiveness and safety for breast augmentation [2], followed by the use in buttock augmentation [3] and for treatment for pectus excavatum [4]. These

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Fig. 1 Dual-plane positioning of HA gel in the breast and MRI pictures of this technique

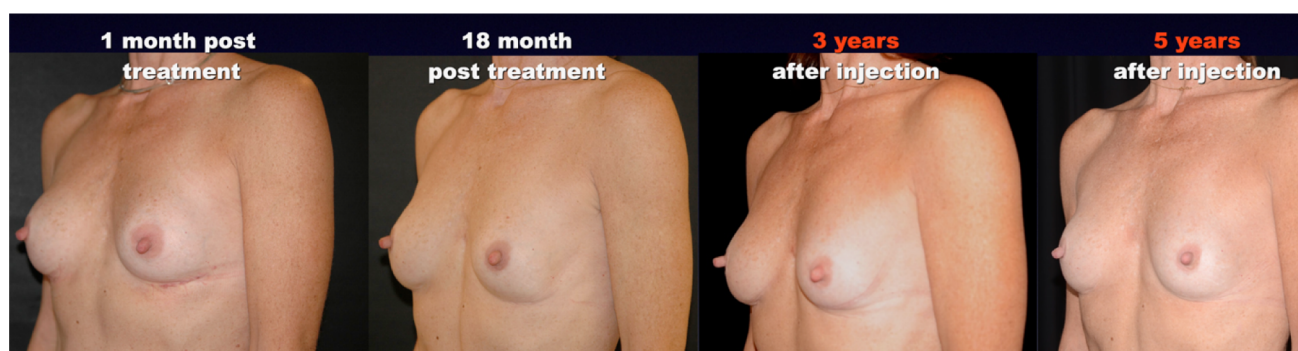
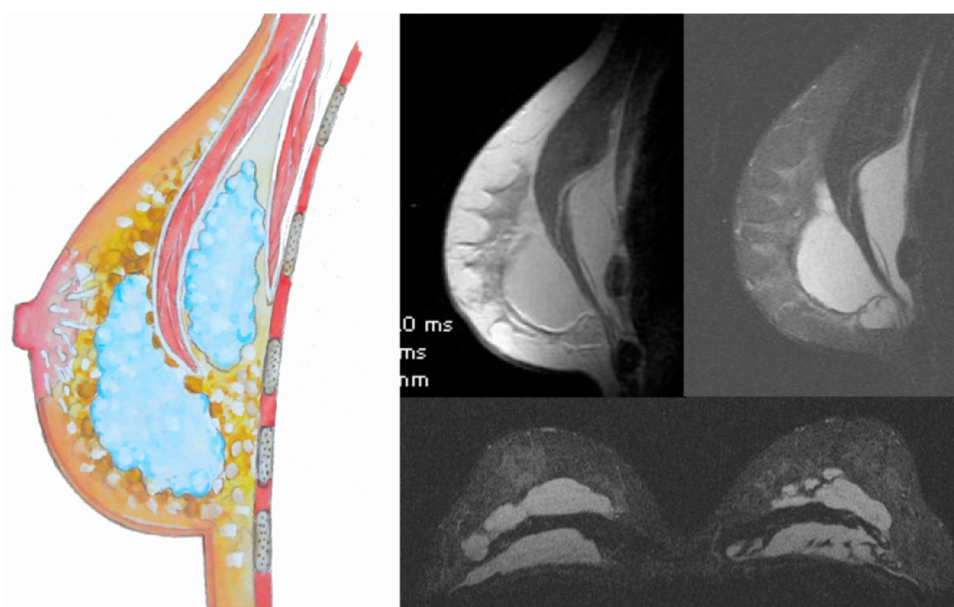


Fig. 2 A 56-year-old woman with 20-year-old 200 cc ruptured silicone implants, (left) rejected new implants and received HA filling of the old implant pocket (150 cc of Macrolane) long duration confirmed with MRI 5 years after implant removal

studies were also followed by other publications for the same indications [5–9]. In addition to this, unpublished clinical series were undertaken (data on file) to investigate the use of HA (Macrolane®) for calf augmentation and male chest (pectoralis major) enhancement. A high patient satisfaction and a low frequency of complication were found in most investigations.

Evolution of HA Filling for Body Shaping and Volumization

In the female breast, a relatively high degree of capsular contracture was also noted. This was not noted in other areas, and the explanation for this is unknown but may possibly relate to the fact that the glandular tissue is known to contain *Staphylococcus epidermidis*. For this reason, and to get a smooth and nice upper pole slope, a dual-plane technique placing some of the HA fillers in the

submuscular space in the upper pole and in the supra-muscular space in the lower pole was developed (Fig. 1). Patients with subglandular HA and capsular contracture could usually easily be treated with a percutaneous squeezing method similar to what was used in the 1970s for silicone implants with capsular contracture. Squeezing of HA with contracture in breast obviously did not have the same risk as doing this with silicone implants as HA naturally is absorbed and does not have the risk of developing problematic siliconomas.

The main drawback of body contouring with HA was, however, the limited duration of the products. A Gaussian normal distribution was noted on all biological conditions, which reveals that the product had considerably longer duration in some patients than the average. One example of this was in cases when HA was injected into the old implant pocket after the removal of silicone implants in patients who requested implant removal but refused new

implants and still requested maintaining breast volume (Fig. 2).

Due to the fact that HA treatment of the female breast was simple and reached a large media attention, many aesthetic physicians who were not trained plastic surgeons started to offer patients this treatment. This resulted in a large population of women who were not treated in a way described by the author (video supplement 1) of this article: spreading the HA in the breast instead of placing it as an implant deep to the gland. This resulted in problems to do

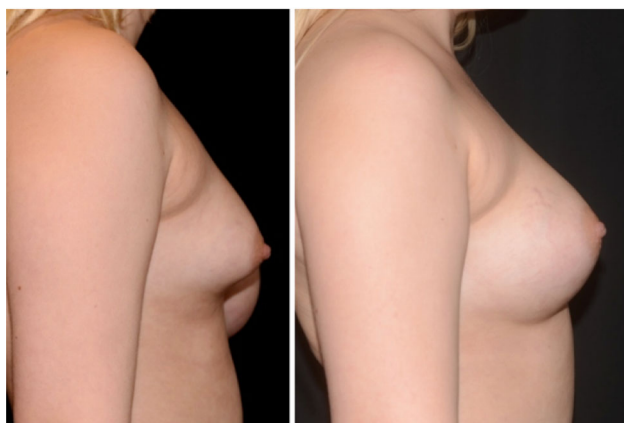


Fig. 3 Tuberous breast deformity before and 2 years after two-stage fat grafting total 260 cc

mammography where the glandular tissue was obscured by the HA. Radiologist had to do ultrasound (HRUS) to be able to adequately evaluate the glandular tissue. This necessitates additional time and cost, and for this reason, many radiologists opposed to do HA treatment of the breast, which resulted in withdrawal of the breast augmentation indication for HA (Macrolane®) in April 2012.

Since the mid-1990s, a large number of different HA products have been studied and introduced to the market and many new indications for their use in the face are established in the clinical routine [8]. The use of HA for body contouring has, however, in spite of several indications, good results and high patient satisfaction not become established and common aesthetic procedures. The above-mentioned problems are some of several explanations for this. In addition to this, the cost and benefits are unfavorable. Even if many patients are willing to pay an additional cost to avoid surgery and still get a good improvement, it is clear that for most body contouring procedures, the volume needed to create considerable changes is relatively large and thus the cost for the products becomes a major obstacle. Due to this following the above-described withdrawal of indication for the procedure that had the largest demand: breast enhancement, the Macrolane® product was taken completely off the market in 2017. Since then, very few HA products for body contouring (MLF 1&2; Hyla Corp. Co) are available in the market. It is important to acknowledge that these products do not have the same level

Table 1 Pros and Cons of Hyaluronic acid filling and fat grafting

HA
+ A naturally occurring polysaccharide in the body
+ Without known allergenic effects
+ Simple
+ Fast
+ Usually only local anesthetics needed
+ High initial patient satisfaction
– Limited and variable duration
– Expensive for larger volumes
– Capsular contracture common in female breast
– Obscure mammography
Fat grafting
+ Survived fat permanent results
+ Soft natural results of survived fat
+ Cost-effective and long term
+ High patient satisfaction
+ Many patients have fat deposits that they want to use and remove
– General anesthesia commonly needed
– Variable and sometimes unpredictable fat survival
– Optimal harvesting, fat preparation and transplantation technique not established
– Risk for donor site morbidity
– Limited donor material in thin patients

of scientific evaluation as the first used HA for body contouring (Macrolane®).

Alternative Techniques

An important and additional reason for the lack of growth of HA for body contouring is the introduction and refinement of fat grafting techniques. In the 1990s, the safety and effect of fat grafting was greatly debated. Today fat grafting is one of the most commonly performed procedures in plastic surgery. Mostly, this is done as an adjunct to other procedures such as face lifts and breast augmentation but commonly also as a stand-alone procedure (buttock augmentation and breast augmentation). Even if the safety and effect has been debated, it is today generally accepted as safe (with the exception of mega fat grafting to the buttocks) and effective treatment [10, 11]. There are now questions about the facts that good outcomes with durable results can be obtained (Fig. 3) and fat grafting is what mainly has replaced the use of HA for body contouring. Comparing fat grafting to HA augmentation for body contouring, there are obviously both pros and cons (Table 1).

A word of warning is in place related to this article; due to the simple techniques for injection of “off-the-shelf” filler material, other products have been introduced to fill this need; an example of this is AQUAfilling® gel (Biomedica Corp.). These types of products have commonly not been thoroughly scientifically investigated before introduction. Severe complications are known to occur [12–15, Video Supplement 2], and it is recommended that new nonhuman filling materials should be avoided until proven safe and effective in good scientific studies.

Future Development

The future of HA for body shaping and volume restoration is difficult to predict, but as stated by Heraclitus 500 BC: “There is nothing permanent except change,” and for sure, we can expect change also related to HA for body contouring. One of the main limitations with HA for body contouring is the high cost for producing large volumes of HA, and today, new HA fillers are under development that can be produced at a much lower price per milliliter than the present ones (Hallura Inc, Haifa, Israel). Hopefully, this development will also lead to longer duration and thus even higher patient satisfaction.

Conclusions

There is now doubt that there is a great demand for simple methods to volumize the body. In the face, the use of HA fillers has exploded and today there are many safe and well-established procedures for facial beautification and rejuvenation. In the body, however, this is not the case, mainly related to limited duration and an unfavorable cost/benefit ratio. Use of other nonhuman fillers should be avoided until they have good scientific documentation of safety and effectiveness. New HA techniques under development may lead to reintroduction of HA for body shaping and volume restoration in the future.

Compliance with Ethical Standards

Conflict of interest Dr. Hedén is a founder and shareholder of Hallura Inc., a startup company developing the first non-BDDE stabilized HA filler.

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