Surgical Versus Nonsurgical Cosmetic Procedures

Gervaise Gerstner, MD; Alan Matarasso, MD

There has been an increase in nonsurgical interventions for facial rejuvenation since 2001, which can be attributed to an increase in the use of injectable fillers, volumizers, and biostimulators for soft tissue augmentation. The efficacy and duration of these products depend on their mode of operation, site of injection, and composition. Semipermanent devices offer a compromise between short-term and long-term results.

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Cosmetic surgery is an elective procedure influenced by both medical and technological advances. However, consumer demand for cosmetic techniques is largely influenced by less well-defined conditions, including both patient attitude and current trends. Thus, the increasing scope of surgical techniques and changing attitudes toward available cosmetic surgery have driven dynamic growth of the cosmetic surgery market.

The American Academy of Facial Plastic and Reconstructive Surgery publishes an annual report based on a survey circulated to its members and physicians certified by the American Board of Facial Plastic and Reconstructive Surgery.[1] The overall objective of the 2006 survey was to monitor current trends in facial cosmetic surgery by providing insight into current facial reconstruction methods and information regarding the frequency of both reconstructive and cosmetic surgery. In the annual report, the survey results are compared to similar reports conducted since 2000.[1]

SURVEY RESULTS

The 2006 American Academy of Facial Plastic and Reconstructive Surgery survey included questions on surgical procedures such as blepharoplasties, implants, forehead lifts, hair transplantations, ablative skin resurfacing, lip and chin augmentation, otoplasties, rhinoplasties, rhytidoplasties, and scar revision.[1] Of these, the most popular procedures were blepharoplasty (57.5 procedures per surgeon, on average), rhinoplasty (53.5 procedures per surgeon, on average), and rhytidectomy/rhytidoplasty (52.8 procedures per surgeon, on average). The most common nonsurgical procedures included botulinum toxin treatments (384 procedures per surgeon, on average), microdermabrasion (264 procedures per surgeon, on average), and hyaluronic acid (HA) injections (168.9 procedures per surgeon, on average). There also was an increase in soft tissue augmentation procedures using fat, calcium hydroxylapatite (CaHA), polymethylmethacrylate (PMMA), and poly-L-lactic acid (PLLA) injections.[1]

The results of the 2006 survey revealed some interesting trends in the number of patients using cosmetic surgery.[1] Between 2000 and 2006, the overall number of procedures increased by 39% overall. This increase was primarily attributable to increases in nonsurgical cosmetic procedures among women (69% increase) and men (91% increase). Women continued to be more likely to opt for facial cosmetic surgery than men; women accounted for 77% and 81% of all surgical and nonsurgical procedures, respectively. Since 2000, the number of surgical procedures in men increased by 29%, while the number of nonsurgical procedures increased by 91%; since 2005, the number of surgical procedures in men

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Dr. Gerstner is from Park Avenue Skin Care, New York, New York. Dr. Matarasso is from the Department of Plastic Surgery, Manhattan Eye, Ear and Throat Hospital, New York.

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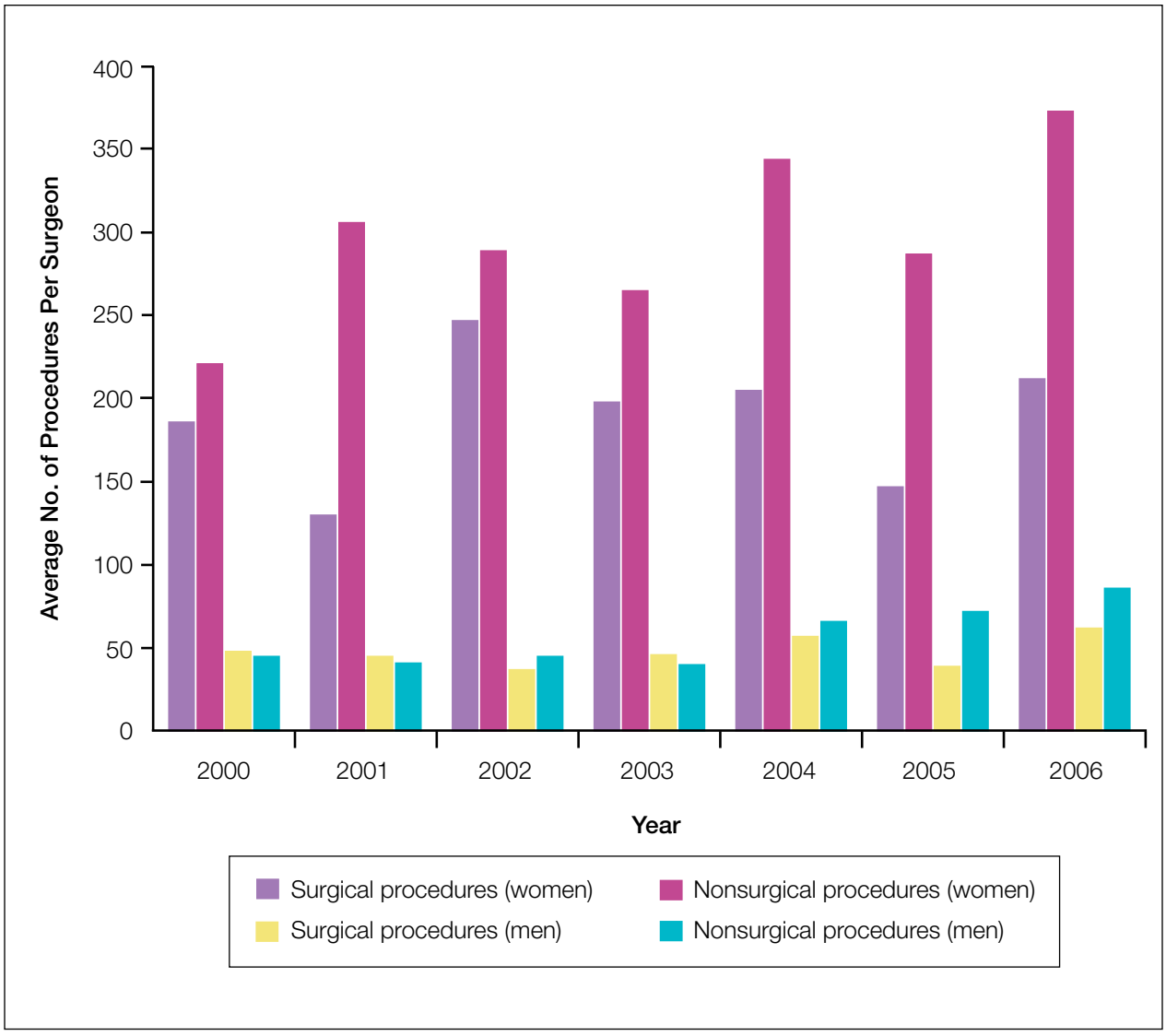
Correspondence: Alan Matarasso, MD, 1009 Park Ave, New York, NY 10028 (matarasso@aol.com).



Average number of procedures performed per surgeon from 2000-2006. Data from the American Academy of Facial Plastic and Reconstructive Surgery.[1]

increased by 59%, while the number of nonsurgical procedures increased by 19% (Figure).[1]

THE RISE OF MINIMALLY INVASIVE NONSURGICAL PROCEDURES

It is tempting to speculate that patients are moving away from surgical procedures, which can be painful, risky, expensive, and may sometimes require long recovery times, to procedures that can be performed quickly, relatively painlessly, and more affordably, with little downtime. The reality is more complex.

Patients are not simply rejecting surgery and choosing minimally invasive nonsurgical procedures; these procedures do not replicate each other. Patients may be disappointed if they anticipate injectable products to be a replacement for surgery. These techniques complement, enhance, and address needs that surgery does not; although they may delay the desire for surgery, they will not replace it. Instead, a new group has emerged of patients who have not been previously tempted by cosmetic surgical intervention. This rise in the number of minimally invasive nonsurgical procedures shows that the use of fillers, volumizers, and biostimulators is a principal growth area. These procedures include devices intended to fill rhytides and devices designed to restore volume and youthful facial contours. Since 2002, the number of minimally invasive nonsurgical procedures has risen steeply, with botulinum toxin type A, microdermabrasion, and laser resurfacing increasing by 221%, 199%, and 112%, respectively.[1] Increasing

popularity of injectable fillers, volumizers, and biostimulators may be a possible contributory factor underlying this trend.

FILLERS, VOLUMIZERS, AND BIOSTIMULATORS

In 1981, there was only one product available as a dermal filler—bovine collagen (Zyderm®). Currently, there are a multitude of products approved by the US Food and Drug Administration (FDA) for aesthetic indications. A number of new injectable products such as HA (Juvéderm™), PMMA microspheres (ArteFill®), CaHA (Radiesse®), and Perlane® have gained FDA approval for cosmetic use, and others such as HAs (Restylane® Fine-Lines/Restylane Touch®, Restylane SubQ™, PLLA [Sculptra®]) are currently under review.

Longevity of Volumizing Effects

Patient Choice—Patients can choose from a wide range of products that differ based on their ability to maintain correction over time. Some patients feel more comfortable with short-term corrections, as suboptimal or unsatisfactory results and adverse events may be temporary in nature. Other patients opt for permanent correction to avoid the inconvenience and cost of repeated visits. Semipermanent treatment options offer a compromise between transient, short-term results, and long-term results, with the associated risks.

Temporary Products—Fillers and volumizers are commonly differentiated by their longevity of effect, the type of correction offered, convenience, the method of manufacture, and side-effect profile. They are further categorized as temporary or permanent devices, with a new category of semipermanent products providing intermediate durability.[2]

Temporary fillers are used to directly fill lines and wrinkles, and the duration of effect correlates with the speed of product degradation from the area of injection. For example, collagen-based products vary greatly in terms of their origin and are derived from a number of animal and human sources. They tend to produce correction that lasts for 3 to 12 months after injection.[2]

Hyaluronic acid–based products differ mainly in the extent of chemical cross-linking between HA molecules, which determines the physical properties of the resultant gel. Products with a greater amount of cross-linking are denser and better able to withstand enzymatic degradation. For example, with higher density products such as Perlane and Juvéderm, patients may see results lasting 6 to 12 months or beyond.[2] Nevertheless, the precise longevity of these more robust gels has yet to be established because long-term follow-up studies are currently lacking. Medium-density products such as Restylane offer more durability, with research indicating a superior longevity of effect compared with bovine collagen at 6 months.[3] By 6 months, however, correction will have fallen by approximately 40% and continues to decline afterward. Products with a lower density such as Restylane Fine-Lines/Restylane Touch have a duration of effect of approximately 2 to 3 months.[4]

Permanent Products—Polymethylmethacrylate particles are not broken down by the body; therefore, the implant is assumed to offer permanent correction, with the particles eventually being encapsulated by new collagen. A follow-up study of PMMA microspheres found that satisfactory results were maintained for 1 to 2 years in 91% of patients (N=290). Nevertheless, senescence leading to facial sagging means that patients will require touch-up injections every few years to maintain correction.[5]

Semipermanent Products—Calcium hydroxylapatite and injectable PLLA occupy the semipermanent biostimulator category. Both of these polymers are biodegradable and are thought to create new volume in the injection area by stimulating endogenous collagen synthesis.[6,7] Reports have described PLLA as producing a gradual increase in volume and correction lasting for up to 2 years.[8,9] In one study using CaHA, correction persisted in all patients for up to 6 months, but no data were presented beyond this time point.[6] A series of case studies also showed that improvements over baseline measurements in volume persisted for up to 9 months, though the improvement was only approximately 70% of the maximal value in one patient (similar data not reported for other case studies).[10]

Type of Correction

In capable hands, many injectable fillers can be used to do more than fill rhytides or scars. Because these products are able to add volume and recontour the face, a greater variety of defects can be treated than in the past. Previously, bovine collagen was the only filler available, indicated for the correction of lines and wrinkles. Bovine-based collagen marketed as Zyderm 1 and Zyderm 2 is used to treat fine lines, wrinkles, shallow scars, disease- or trauma-related atrophy, and other such soft tissue defects; Zyderm 2 contains almost twice the collagen concentration of Zyderm 1 and, as such, may offer more pronounced and durable results. Zyplast® is a bovine-based collagen cross-linked with glutaraldehyde and is indicated for the correction of contour deficiencies of soft tissue. The cross-linking results in more pronounced and durable effects than Zyderm and, as such, Zyplast

can be used to treat more marked lines, wrinkles, and scars.

Human-based collagens are more costly, and this product group is considered to offer more convenient correction than their bovine-derived counterparts. Products such as CosmoDerm® and CosmoPlast® obviate the need to skin test for potential allergy prior to injection, as is required with animal-based collagen products, and are rapidly gaining in popularity.

Hyaluronic acid–based products are primarily used to fill lines and wrinkles of varying severity in different parts of the face. An exception is Restylane SubQ, which is intended for shaping the contours of the face. The product was approved for sale in Europe in April 2004 for subcutaneous tissue augmentations but has yet to receive FDA approval.[11,12]

Poly-L-lactic acid was approved by the FDA in 2004 for the treatment of the appearance of human immunodeficiency virus (HIV)–associated facial lipoatrophy; a cosmetic indication has been approved in Europe and several other countries and is currently under FDA review. Poly-L-lactic acid is effective at restoring large areas of severe volume loss in patients with HIV-associated facial lipoatrophy.[8,13] More severe volume loss is treated by multiple treatment sessions, allowing volume to be gradually restored over time; larger areas of volume loss are addressed with greater quantities of PLLA injected per session. This flexibility means that PLLA is suitable for the treatment of moderate to severe folds and wrinkles, as well as for addressing larger areas of volume loss, though this is not currently an approved indication in the United States.

In the United States, CaHA is approved for the treatment of oral/maxillofacial defects, vocal fold insufficiency, radiographic tissue marking, and HIV-related facial lipoatrophy, and has been recently approved for correction of folds and wrinkles around the nose and mouth. Injectable products are able to smooth lines, folds, and wrinkles, as well as restore lost volume and add definition to facial contours. Physicians are now equipped with a number of minimally invasive nonsurgical options designed to address the many aspects of facial rejuvenation that might have previously required invasive surgery.

Convenience

Convenience factors, such as the time required to carry out a procedure, downtime, the requirement for preprocedural skin testing, and immediacy of results, vary among injectable products. As individuals weigh these factors in importance, some products may appear to be more convenient than others. It is important for the physician to advise the patient on these factors in order to allow for an informed decision.

Method of Manufacture

Some patients prefer to receive treatment with products isolated from sources such as the tissues of a living organism, rather than substances that have been industrially produced. Because patients are now able to choose among products that are either animal derived, human derived (isogenic or autogenic [from patient tissue]), bioengineered, or manufactured from synthetic components, those patients with concerns regarding a method of manufacture can frequently select an alternative product.

Side-Effect Profile

For medical devices to be granted FDA approval, they must first be demonstrated as effective and not present any unreasonable risk to the patient. These devices can vary greatly in terms of their safety and tolerability profiles, and patients should be fully informed of the potential risks and benefits associated with any product before starting treatment. Patients who have not previously undergone treatments with an injectable product or who are particularly fearful of pain may be advised to opt for treatment with products containing a local anesthetic injected with a fine needle. Alternatively, patients can receive topical analgesics, nerve blocks, or systemic anesthesia.

THE PREVALENCE OF BOTULINUM TOXIN TYPE A, MICRODERMABRASION, AND LASER RESURFACING

The number of botulinum toxin type A, microdermabrasion, and laser resurfacing procedures performed has increased since 2002 by 221%, 199%, and 112%, respectively.[1]

Botulinum Toxin

Indeed, botulinum toxin was reported to be one of the most commonly performed nonsurgical procedures in both men and women in 2006.[1] With time, the tolerability and cosmetic effectiveness of botulinum toxin in the glabellar region have been established. Botulinum toxin has been used extensively to rejuvenate the upper face; its off-label use in all areas other than the glabella (to improve nasolabial folds, perioral rhytides, chin dimpling, marionette lines, and downturned oral commissures) is helping to maintain its popularity, despite the increased risk for adverse events associated with injection in these areas.[14]

Microdermabrasion

Microdermabrasion is a relatively new technique used to improve skin tone, texture, and pigmentation.

Although patient satisfaction with microdermabrasion appears to be quite high,[15] there is an absence of well-designed controlled trials to compare the relative safety and efficacy of microdermabrasion with other resurfacing procedures. The factors that contribute to patient satisfaction are minimal discomfort, lack of downtime following the procedure, and perception of immediate results. Furthermore, there is no need for patients to discontinue their normal skin care routine prior to treatment.[15] Similarly, the demand for nonsurgical procedures with decreased recovery time has caused a shift away from traditional laser resurfacing techniques. In the case of nonablative laser rejuvenation, thermal damage can be induced in the dermis, stimulating collagen remodeling and leaving the epidermis unharmed.[16] Although repeat sessions usually are required, improved technology means that pulsed dye lasers targeting microvessels, intense pulsed light targeting both melanin and microvessels, and midinfrared lasers targeting dermal water and collagen are able to improve skin texture, color, and wrinkling, with minimal patient inconvenience.

THE FUTURE OF COSMETIC SURGERY

The rapid rise in minimally invasive nonsurgical procedures has not been at the expense of surgical cosmetic procedures. Cosmetic surgery often is the only treatment option for defects such as blepharoplasties, rhinoplasties, and rhytidoplasties, which remain among the most common procedures performed by cosmetic surgeons. Moreover, the results of surgery are typically long lasting.

Surgeons are increasingly combining surgical techniques with minimally invasive nonsurgical methods to achieve more complete facial rejuvenation. For example, the underlying bone structure of the face can be surgically altered, and the volume of soft tissues lost through aging can be augmented with fillers or restored with a soft tissue volumizer to recapitulate youthful contours. Also, minor imperfections such as asymmetry can be corrected by using fillers, volumizers, and botulinum toxin.

COMMENT

Improved technology has widened the choice of minimally invasive nonsurgical treatments available to patients seeking facial cosmetic changes. The growth in the number of nonsurgical procedures conducted suggests that new products are succeeding as rejuvenating procedures. Injectable fillers involve procedures that are less risky, more cost-effective, less time-consuming, and less painful than surgery. There also is a growing awareness that loss of facial tissue volume cannot be corrected entirely by surgical procedures.[17] However, it must be emphasized that nonsurgical procedures "fill" and surgical procedures "lift"; they enhance and complement one another. Nonsurgical procedures may delay the timing of surgery, but they do not replicate the effects of surgical procedures.

Advances in technology do not entirely explain the continued expansion of cosmetic procedures or the rise in minimally invasive nonsurgical procedures. As a cultural phenomenon, cosmetic surgery is increasingly becoming more popular and more socially acceptable.[1] It is hardly surprising that the increasing use of injectable products dominates many of the discussions in facial cosmetic surgery. Although more products are likely to be licensed and approved for use in the near future, their success in an increasingly crowded marketplace will depend on their ability to safely deliver correction that patients desire.

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