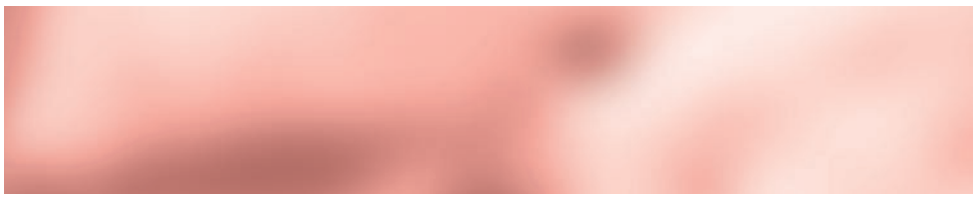

8

Secondary augmentation

Steven Teitelbaum

Key points

- Over time, more revisions of breast augmentations will ultimately be done than primary augmentations.
- All problems should be evaluated for the contribution of: (1) parenchyma/tissue coverage; (2) skin envelope; (3) capsule; (4) pocket position; and (5) the device.
- Optimizing soft tissue coverage is the first priority in all breast augmentation surgery.
- Informing a patient that another operation is not indicated and refusing to operate is an option that must not be forgotten.

Introduction

A requirement of the product labeling on all breast implants is to inform potential patients that a breast implant is not a lifelong device and will inevitably need replacement. This means that each of the nearly 50,000 women a year undergoing breast augmentation in the United States is destined for a revision. In the meantime, the millions of women who have undergone an augmentation since the inception of the modern operation in the 1960s have already or will require a revision in the future. Many women will live long enough to need or want more than one routine revision; others will need more than one operation to correct a complex problem; while others will have revisions in pursuit of a physical perfection unattainable for their underlying anatomy. It is therefore a fact that more secondary breast augmentation procedures will be done than primary procedures.

We must be as diligent in our understanding of secondary augmentation as primary augmentation. In fact, the frustration and dissatisfaction that some revision patients experience casts a pall over our entire specialty, reducing demand not just for primary augmentation, but for other aesthetic surgical procedures as well. As a specialty, it is incumbent upon us to do our utmost to satisfy, to the greatest extent possible, the dissatisfaction of previous augmentation patients. Furthermore, experience with secondary augmentation improves our results with primary augmentation. Every secondary augmentation patient has their own story, and each patient encounter is an opportunity to

8 Secondary augmentation

learn more about what might have been done differently in that patient's past to have either reduced the extent of their dissatisfaction, physical deformity, or merely to have increased the time interval between operations.

Every patient considering secondary breast augmentation surgery has some complex interrelated issue between her tissue, the device, and her expectations. Each of these parameters needs to be considered for every patient complaint. While the situation can be simple in the case of a patient with a saline deflation who otherwise was perfectly pleased with all aspects of her surgery, the process can be extremely complex in the case of a patient with multiple past surgeries, thin tissue coverage, stretched skin, asymmetry, contracture, palpable implant edges, and high expectations for her outcome.

Each of these categories: tissues, device, and expectations, have within themselves a vast number of potential problems and complaints, creating literally hundreds of permutations that drive patient consultation for secondary breast augmentation surgery. Therefore, it is implausible for a single chapter or even an entire book to detail management for the myriad of possible presenting scenarios. Fortunately, there is a way to organize a secondary patient's presenting complaints in a way so that they can be methodically organized, allowing the surgeon to create a thorough and thoughtful management plan. A sound philosophical approach rather than a series of algorithms or recipes will provide for the optimal management of our future secondary augmentation patients.

This chapter will focus on long-term problems following breast augmentation, rather than managing short-term issues such as infections and hematomas as these really fall under the purview of management of complications from the primary surgery. As we will see, most long-term adverse outcomes of breast augmentation result either from suboptimal surgical planning decisions, imperfect execution of the initial operation, or failure to set appropriate patient expectations prior to the initial surgery, therefore allowing the uninformed patient to continuously pursue a series of reoperations in pursuit of the unwise or anatomically impossible outcome.

So too is a detailed treatment of each of the surgical procedures and sequences commonly used to treat secondary augmentation deformities beyond the scope of the chapter. The reader instead will learn to analyze the complex variations of implant problems in order to provide the patient with thoughtful and definitive management.

Scope of the problem

More concerning than the general notion that an augmentation does not last a lifetime, is that more than one in five women undergoing a breast augmentation undergoes a second breast surgery within 3 years. That number is unacceptable for a purely elective, cosmetic operation. Worse yet, is that some of these women enter a cycle of revision procedures, in which they endure the expense, risk, and anguish of repeated surgeries in an effort to fix their problems. And some of these problems can never be remedied. There are many women even in their late 20s several years following their augmentation who feel more self-conscious about the appearance of their breasts than they did prior to their initial augmentation.

Most surgeons do not believe that the 3-year reoperation rate is as high as it is, but it has been repeatedly validated by multiple PMA trials by different manufacturers, different implants, and different surgeons. Unless a surgeon had their personal data CRO reviewed in a PMA study, then it would be hubris to suspect their rate to be any lower. There is another hidden lesson that is proved by the similarity in reoperation rates seen in studies of different implants: that the predominant cause for reoperation is not the device, but it is how we educate patients, make surgical choices, and conduct the surgery. This fact is further validated by data from a single surgeon isolated from the remainder of surgeons in the same PMA study, in which that one surgeon had lower reoperation rates than the pooled average of the other doctors in the study. This striking disparity in outcomes with the same device again proves that results are less related to the device than to other factors. As a competitive breast implant manufacturing industry touts the relative advantages of their devices, an unintended consequence is that patients and surgeons alike have come to believe that the device is an important determinant of the result. However, the totality of data suggests that this is false; the largest documented improvements in patient outcomes have come from improved processes rather than any implant.

Surgeons may doubt the extent of this problem due to a natural tendency to remember our happy patients. Moreover, many of our dissatisfied patients have lost

confidence in us and have gone elsewhere if they needed a revision. Sometimes, problems are not visible for years after the first surgery, and the patient has moved, the doctor has retired, or the patient has even forgotten the original surgeon's name. At best, we are only aware of our known personal revision rate, but it is the patient's revision rate that matters.

How long do implants last?

This is frequently asked by potential breast implant patients but is a very different question from 'When will I likely need another breast implant surgery?' Understanding the difference between these two similar but rhetorically different questions offers important insights into the issue of secondary breast augmentation. From a purely statistical point of view, this issue can be rephrased in the following way: 'If devices fail at a rate of about 1% per year, why is the 3 year reoperation rate nearly seven times that?'

The presumption in asking how long implants last is that device failure will be the likely causative reason for their secondary breast surgery, but in fact it is not likely to be. Most revisions are the result of issues with patient tissue or patient expectations. Weight gain and loss, pregnancy, lactation, gravity, hormonal fluctuations, sun damage and time itself will inevitably make even the non-augmented breast change with time, and with the added weight and pressure of an implant, these senescent changes of the breast can be more rapid and more pronounced. Ptosis, soft tissue atrophy, implant visibility and palpability, skin stretch and capsular contracture are all issues of the patient's own tissues and not actually of the device. Of course, some devices may be less likely to cause contracture or to be visible with a given degree of tissue thickness, but the role of the device in these issues is almost always less contributory than the patient's tissues and biology.

Just as the primary augmentation patient presenting today may have sought consultation a year earlier or a year later than they did, so too is there no absolute time frame at which a patient seeks consultation for a secondary surgery. The same problem that would lead one woman to seek an immediate revision may not bother another woman at all or she may not want to undergo surgery. More difficult to define is to understand disparities that occur between the potential offered by a patient's tissue and the cosmetic goal that she pursues. This process was often set into motion at the time of the first surgery, in which a thorough or honest assessment of her tissue and the limitations it posed may not have been realized or discussed. Patients with such thin tissue that their ribs are visible should not present for secondary surgery wondering why their implants are visible.

Multiparous women and weight loss patients do not understand why their implants do not stay high and round. Women with subtle forms of pectus carinatum do not understand why they do not have more cleavage. Patients with subtle volume, ptosis, or IMF asymmetries may seek revision for issues that are within normal limits. These issues can bring women in for revision surgery before really necessary. Recognizing the limitations of patient's tissues and informing the patient is an important role for the physician seeing the secondary augmentation patient. These sorts of issues become central in the evaluation of a secondary augmentation patient. The surgeon must assess the interplay of patient tissue and biology with device, surgical technique, and patient expectation.

Know the normal ideal augmented breast

Gillies's first principle of plastic surgery, 'know the normal', is as important with secondary breast augmentation surgery as with any other reconstructive procedure. And the differences between the unoperated ideal normal and the augmented ideal normal should also be understood. Many plastic surgeons fashion themselves as 'artists', opposing efforts to characterize surgical aesthetics by any canons of beauty. These concepts never deterred artists such as Da Vinci. And without documenting measurements, we cannot learn from ourselves or from one another. There are only three critical parameters that define the ideal augmented breast: (1) base width and its relationship to N : IMF; (2) amount and distribution of fill within; and (3) implant-soft tissue relationships, including palpability of the implant.

Base width and nipple: inframammary fold distance

There are many different breast measurements that have been described, but none is as powerful as simply looking at the ratio of the base width to the nipple to inframammary fold distance (IMF). If these ratios are not optimal, there will be a deformity. Ideally, this

relationship should be 11 cm : 7 cm; 12 cm : 8 cm; 13 cm : 9 cm. This holds true in a wide variety of breast types, whether augmented or not. Determining the root cause of variances from these ratios in the secondary patient can be challenging, as it requires defining differences between inframammary fold height on the chest wall, implant height and nipple height. In nearly all cases of a suboptimal appearing breast, there will either be asymmetries in these measurements between the breasts, or an inappropriate relationship relative to the dictates of these canons.

Amount and distribution of breast fill

In the AP view of the ideal non-augmented breast, there is a clear line of demarcation between the breast and the surrounding tissues only from about 4 o'clock to 10 o'clock, when looking at the right breast; the remainder of the breast tapers off gradually without a visible step-off, blending into the surrounding tissues. At the lower portion of the breast, this is what we call the inframammary fold. The only exception to this in the non-operated breast is in the rapidly growing adolescent breast in which the skin has not yet stretched to accommodate the increasing volume, the engorged lactating breast, and in the constricted lower pole breast, which for the same reason, forces the envelope of the upper breast to excessively fill, creating a marked step-off between the implant and the surrounding tissues. In the lateral view, the same breast would be relatively straight or empty in the upper pole, depending upon how full that patient's breast skin envelope is. It is never convex in the non-augmented breast.

In the augmented breast with ideal implant volume, one that fills the breast but does not stretch the breast, these relationships are still largely preserved. A progressively larger implant will create a more visible delineation of the perimeter of the breast than a non-augmented breast. This may or may not be desirable to a particular patient, but all patients should understand than an implant that creates increasing degrees of this appearance is objectively not natural, and also risks pressure atrophy of the breast parenchyma and progressive stretch of the overlying skin.

Similarly, the ideal upper pole in an augmented breast should also be straight. An upper pole convexity is indicative of over-fill; a concave upper pole indicative of under-fill. Some patients desire that upper 'bulge' or 'shelf', With nulliparous, young, and tight lower pole skin, there may be situations in which upper convexity is maintained, but with time lower pole skin (unless there is a contracture or mild degrees of inferior pocket closure), will give way to the weight and pressure of the implant, allowing this early upper bulge (whether desired or not) to dissipate as the implant filler redistributes itself towards the bottom of the shell. True 'drop' of an implant, as defined by the implant shifting caudally on the chest wall and coming to rest in an inferiorly displaced position, is uncommon and considered a deformity. There are many patients with small and tight breasts who want to achieve a large size and cannot understand why this is unattainable without the upper bulge, and they need to be educated. Similarly, patients with lax envelopes who want only a small increase in volume often do not understand why they still have upper pole convexity, and they similarly need to be educated. Thus the amount of distribution of fill within the breast envelope, consisting of both implant and native tissue, is of paramount importance in determining breast aesthetics.

Implant–soft tissue relationships

Obviously, the non-augmented breast has no implant visibility or palpability, and in the augmented breast, the goal is to make the implant as indetectable as possible. Any woman receiving a breast implant should expect that her implant will in some way and in some positions be detectable. The extent of this is dependent somewhat on the type of the implant, but, moreover, is a function of tissue coverage relative to the size of the implant. A small bag of pebbles would be relatively undetectable if used to augment a 'small D' to a 'mid D', but no implant on the market today can augment a very small breast to a very large breast and not be obvious. Capsular contracture and implant overfill/underfill all contribute to excessive implant perceptibility. No patient or surgeon should ever expect to eradicate this. The goal is to make this as subtle as possible, and the indication for surgery to correct this is not that the implant is detectable, but whether it is likely to make the implant less detectable in the long run. Nearly as important as the thickness of tissue coverage and the thickness of the capsule, but harder to define, is the dynamic relationship between the implant with the capsule, and the capsule with the

overlying tissue. Any study that will enable better prediction of these phenomenon will profoundly help in the avoidance and correction of dissatisfaction following breast augmentation.

Consultation with the secondary augmentation patient

Whether or not you were the original operating surgeon, you must assess the state of the patient's condition, the limitations posed by their biology or tissue, and the likelihood for improvement. I have seen a tendency for surgeons to be more circumspect about reoperating on their own patients than they would be about operating on a new secondary patient entering their practice. In fact, however, the indications for surgery should be the same. Why would there be this difference? Other than medico-legal issues, clearly there is a tendency when it is your own dissatisfied primary augmentation patient to be more suspicious of changing patient expectations than a shortcoming in the surgical plan or execution. When the patient comes from another surgeon, one can be too quick to be sympathetic to the patient's requests and to blame the previous surgeon's poor planning or technique.

Every effort must be made to secure all previous operative records. Incisions, pocket locations, implant type and fills, use of drains, recovery, changes in cup size, lactation and weight loss history, and satisfaction/dissatisfaction with each procedure should be documented. Patients should be asked to give a complete laundry list of complaints or wishes for the revision surgery. One by one, the surgeon must assess the validity of their complaint about each issue, seek the cause or source for the problem, and determine whether or not, and to what extent, each problem might be fixed. It is important to recognize not just requests that are unfulfillable, but also those that are contradictory. For instance, a patient may at the same time ask to be larger, yet have edges that are less visible. A patient may ask to be smaller, yet want to have greater upper fill and not want a mastopexy. Examples of this are numerous, and it is important to consider trade-offs inherent in fixing a particular problem.

The surgeon must always be detailed and conscientious in assessing a patient's tissues and the limitations they impose on a result, and never is this truer than in the secondary patient. Many of these patients are seeking secondary operations because their expectations were not properly set in the beginning or procedures were done in an effort to attain an unattainable result. With the passage of time and damage to their tissues, they may even be farther from the possibility of achieving their goal than before their first procedure. It is critically important to assess their tissues and their goals, and reconcile the two. This can be a disappointing conversation for many patients, but the sooner they learn the limitations of their tissue, the less suffering they will ultimately endure. In fact, most patients actually appreciate the candor of a physician willing to engage in an honest and direct discussion, even if the content is ultimately disappointing to them.

And for purely selfish reasons, it would behoove the surgeon to discuss limitations of outcome posed by the patient's own tissues. The dissatisfied secondary augmentation patient is certainly a litigation risk. But short of that, the more realistic the expectations the surgeon sets with the patient, the more likely it will be that the surgeon fulfills the expectation they have given that patient. A common situation with both primary and secondary breast surgery is that there can be a disparity between what the patient wants or is willing to do as opposed to what the surgeon thinks is best. Certainly, the surgeon must never do something they think is inappropriate. But the reality is that sometimes patients just will not do what the surgeon thinks is best. In these situations, it is very important that the patient be informed of the specific trade-offs inherent in their decision, and they must physically sign off on their acceptance of them. Not only does this medico-legally help in transferring responsibility to the patient, the boldness of such a document further encourages patients to accept what their surgeon is encouraging them to do.

While patients in these complex situations may often not select the therapeutic course that their surgeon recommends most highly, a surgeon should never proceed with any course that they feel is not in the patient's best interest. In fact, to justify doing so by arguing that 'this is what she wanted' may be indefensible in court. Plastic surgeons are sometimes pulled in two directions: the demands of the patient and the requirements of her tissues. No other surgical specialty is expected to pay heed to patient requests to the same extent. Ultimately, however, patient demand should not be permitted to press a surgeon toward proceeding with anything they think is inappropriate.

8 Secondary augmentation

Declining to operate on a patient eager to schedule is a key option that the busy reoperative breast surgeon will need to resort to on a frequent basis. It is probably true that the patient will go elsewhere and find a surgeon to meet their request, but that does not make it right.

Secondary breast augmentation surgery runs a spectrum from fairly straightforward surgery to situations that are not only complex, but also even unsolvable. In order to create a treatment plan and to predict the likelihood of improvement, the surgeon must begin by organizing and categorizing each patient's problems. Only after assessing all of the contributing factors to the deformity can solutions be found.

Not fixing a problem or removing without replacement

No discussion of secondary augmentation is complete without making a serious note of the possibility of suggesting that a patient either accept a problem as it is or undergo removal without replacement. This is far easier said than done, as patients typically have set in their minds a particular appearance they hope to achieve with another revision, or they have enjoyed their augmentation so much that they are loathe to be explanted. Many of the worst problems I have seen have been as a result of a single surgeon repeatedly trying to make things a little better for the patient, only instead to have the patient develop ever-worsening tissue problems. It is nearly impossible to tell our own dissatisfied primary augmentation patients that their situation is not likely to be improved, and that all their money, discomfort, time, and expectations were for naught, and that they should either just accept the current situation or actually pay yet again, but this time to have their implants permanently removed.

It is easier, but also very difficult, to say the same thing to a patient whose previous operations were done elsewhere. A combination of hope that we may help them and wanting to avoid disappointing them has led many a surgeon to offer an operation to a patient whose situation is unlikely to be substantially improved. Unfortunately, if we are to make any serious gains in reducing reoperations, we need to be stricter in defining the circumstances in which we will operate, and the situations in which removing without replacement best serves the interests of the patient.

The only way to achieve success in this regard is if these criteria are discussed and understood by the patient prior to their first surgery. It is nearly impossible to make these issues understood and accepted after the patient has paid for and completed their first surgery with certain expectations in their mind. The situation will not be substantially improved until plastic surgeons as a group all educate their patients. Tebbetts introduced the concept of defining specific 'out point' criteria prior to the first operation. His patients must sign off understanding that their surgeon will not perform elective size change unless medical indications or surgeon agreed aesthetic compromises are present, nipple asymmetries <1.5 cm, IMF asymmetries <1.5 cm, and contractures less than a Grade III. The additional benefit of defining these and having the patient sign off on them preoperatively is that it defines a margin of imprecision that the surgeon and patient consider tolerable. Finally, understanding these issues before the first operation further incentivizes surgeons and patients to perform the operation and make the decisions and choices that are most likely to yield an excellent long term result. Similarly, no revision other than explantation without replacement is offered to patients with recurrent capsule contracture after one revision in which all measures were followed that could prevent a recurrence of the contracture, and patients with implant visibility and palpability with tissue pinch <5 mm at the thinnest area.

Causes for reoperation

In PMA studies for both Mentor and Allergan, operation on capsular contracture remains the most common reason for secondary surgery, followed by patient request for size change, scarring, implant malposition, asymmetry, ptosis, and suspected implant rupture. It is interesting to note that actual implant rupture was not listed amongst the top ten reasons for revision of a breast augmentation. It behooves the surgeon to recognize that this list reiterates the importance of patient tissues, surgeon and patient decision making, and surgical technique as a cause of the second operation as opposed to the device itself.

The most complex situation can always be broken down into five causes, each of which has a discrete set of potential solutions: in priority they are paren-

chyma/tissue coverage, skin envelope, capsule, pocket position, and the device. As the surgeon assesses each patient, they should carefully consider each of the five key components that may contribute to the problem, even if the complaint does not at first specifically seem to require consideration. Sometimes there is a problem that the patient had not noticed that the surgeon might overlook, only to be noticed after the revision. Most importantly, none of these can be considered in isolation, as issues in each of these categories can cross over and affect the others, and the correction of one problem may reveal an otherwise masked problem in another category or exacerbate what had only been a mild problem in yet another category.

Manufacturers, patients, and even surgeons have excessively focused on the device as a cause of and solution for problems in breast augmentation patients. While there are undeniably substantial benefits in using various implants in specific situations, by and large the causes and solutions of problems are predominantly related to the patient and surgeon decision making, which is often flawed due to inadequate education of the patient at the time of the initial operation. There is obviously interplay between all of these – and that makes the situation more difficult.

Breast augmentation for surgeons and patients initiative (BASPI)

In 2004, a group of plastic surgeons gathered to consider solutions to concerns that were voiced by the FDA during the 2003 panel hearings. There was concern over reoperation rates, amongst others. This group put together algorithms to establish best practice approaches to several clinical situations that are relevant to secondary augmentation. These flow charts did not define a standard of practice, but rather presented a range of options that are available and need to be considered. They demonstrate how a reasoned approach that considers all options, benefits and tradeoffs, one in which the patient participates, can succeed in reducing the cycle of reoperations that some patients experience.

Specifically, there were algorithms for management of concerns of shell disruption or a leaking silicone gel implant, management of stretch deformities and implant malposition, management of size exchange, and management of capsular contracture. Each of the possible alternatives at each point of the decision making process were posed, and the patient had to initial each point in the decision making tree.

Classification of secondary augmentation problems

The following Teitelbaum classification of breast augmentation problems not only inventories all of the problems, but it suggests solutions, and the likelihood for improvement. It reminds the surgeon of all possible causes and solutions.

They are listed in their order of priority:

- Parenchyma/tissue coverage
- Skin envelope
- Capsule
- Pocket position
- Device.

A patient is given two scores: one for their appearance at the time of consultation, and another for the patient's expected result following surgery. Like the Glasgow coma scale, the lowest score indicates the greatest deformity and the highest score indicates the ideal normal. The highest score of 15 would come from the maximum score of 3 for each of the 5 categories. The lowest score of 5 would come from a score of 1 for each of the categories. Each of the five categories is given a score between 1 and 3 according to the following scale:

1. Significant deformity
2. Minor deformity
3. No deformity.

A patient is first scored according to the appearance at the time of presentation. All of the information derived from the history and physical examination are culled and analyzed within the structure of these 5 categories, in order to give a preoperative score. After scoring each of these five categories in the patients current condition, a second scoring is predicted for the various surgical plans being considered. This helps patients to select which option best meets their needs, and even whether the costs and risks of surgery are enough to justify surgery. This system forces surgeons to look at each of the relevant categories of the surgery and make an assessment of the likelihood of improvement for each. Without such systematic thinking, it is all too easy to inadvertently neglect a pertinent issue or trade-off.

This system also helps to reconcile trade-offs and secondary deformities, e.g. the submuscular patient with adequate soft tissue coverage who elects to go submammary who preoperatively has a '3' for the soft tissue score, may go down to a '2' for that in an effort to raise a '2' for minor ptosis to a '3'. The complexity of these situations requires an organized and coherent approach with which to attempt to quantify the advantages and disadvantages of the various options.

Parenchyma/soft tissue coverage

Assuring optimal soft tissue coverage for a patient's lifetime is the highest priority in secondary breast augmentation, just as it is in primary breast augmentation, and the lack of it is the most prognostic sign of an unsatisfactory outcome. If there is enough tissue coverage, subtle implant malposition can go unnoticed, severe implant folding can be undetectable, stretched and thin skin can still be kept full, and even capsular contraction can be hard to feel. We can change implants; we can move implants; we can reduce skin with mastopexies; we are often successful at treating capsular contracture. But unless the implant is submammary and we can switch to submuscular or dual plane, we do not yet have a way to consistently and significantly augment the soft tissue of the breast. So if a patient has a problem related to very thin tissue coverage, no implant or perfectly executed surgery can fix all of the patient's problems.

If a patient has abundant soft tissue, there rarely is a problem that cannot be substantially improved. On the contrary, there is a rarely a patient with very thin and inadequate tissue for whom a perfect result can be achieved. This truth can be extremely difficult for patients to accept – particularly in a culture in which excessive thinness is so celebrated – and actually can be difficult for surgeons themselves to recognize and accept as well. Obviously, many augmentation patients initially presented because of having small breasts with thin parenchyma. Large implants can further put pressure on the parenchyma, causing increasing soft tissue thinning from pressure atrophy. Tissue can further atrophy following lactation subsequent to the original augmentation. Some patients have had parenchyma removed along with capsular tissue when undergoing previous capsulectomies. In the era of mass silicone fear in the 1990s, many other women unfortunately underwent significant resection of otherwise normal parenchyma and even muscle.

In fact, some secondary breast augmentation patients have soft tissue that is so thin that they are best thought of as if they were subcutaneous mastectomy patients. Some of these patients still bring in photos from the Internet of women with substantial parenchyma thickness as examples of how they want to look. It is very difficult, but important to inform them that their expectations should be based more on the appearance of a subcutaneous mastectomy reconstructive patient than the elective cosmetic patients whose appearance they wish to emulate. There is a paucity of photographs of thin-tissued secondary augmentation patients available, so it should come as little surprise that few if any of these patients are at all aware of how difficult a situation they are in. In fact, subcutaneous mastectomy patients can even be in a better situation than some secondary augmentation patients, as repeated augmentation surgeries and pocket changes can result in a pectoralis that has been partially resected, avulsed off of the sternum, or in some other way allowed to window shade so far cephalad such that it is no longer can cover the implant as well as an undamaged pectoralis can cover the implant in a subcutaneous mastectomy situation.

Patients and surgeons must be reminded that breast implants are at their best when they serve as a platform for the existing breast tissue, projecting it forward, thereby allowing the existing parenchyma to be seen and felt. But when coverage is thin and the implant is large, the implant is not augmenting the existing breast so much as it becomes the breast. To date, there is no device that can mimic the natural soft tissue of the breast. An implant should be viewed not as a soft tissue replacement. Tissue coverage and implant size go hand in hand: coverage inadequate for a large implant may be adequate for a smaller implant. But for this section, we will consider the thickness of the coverage; finding an implant of the appropriate size will be addressed in the device section.

Assessing tissue coverage and the parenchyma

Tissue coverage should be assessed in all breast augmentation patients, both in primaries and secondaries, even if the patient's complaint at that moment doesn't specifically relate to coverage issues. Tissue coverage

always becomes the most important issue affecting the appearance and long term result in a breast augmentation, and it should be assessed before planning any surgery. Caliper pinch thickness at the superior, inferior, medial, and lateral poles should be documented, as well as the visibility of the implant edge. The position of the implant relative to the muscle must be assessed. The patient should contract her pectoralis by pushing her hands together in front of her chest while the surgeon observes the motion of the chest and palpates the attachment of the pectoralis to both the sternum and the ribs along the medial inframammary fold. Usually, one can determine whether the implant is in front of or behind the pectoralis muscle.

In some situations in which the implant is purportedly retromuscular, this exam can reveal that there is actually little or no coverage. This can be seen in cases of severe ptosis, in which case the implant sits so far caudally, that even its superior border sits beneath the inferior border of the pectoralis. It is also seen when the pectoralis was dissected off of the sternum, allowing it to window shade superiorly, slipping over and above the implant. This is possible with every incision, but it is most commonly observed with the periareolar incision, often in cases of very small areolas. This may be due to poor visualization, or a loss of landmarks in which the surgeon, while taking muscle down off of the medial inframammary fold, continues up too far along the sternum until level with the point of access at the areola, exacerbated by the destruction of fibrous attachments between the superficial surface of the pectoralis and the deep surface of the gland, some extent of which is nearly unavoidable with the peri-areolar approach. Interestingly, this is the opposite of the pattern typically seen with a blunt transaxillary approach, in which the muscle is frequently not adequately taken down along the IMF, leaving an implant positioned too high.

While coverage is the main consideration with parenchyma, other significant issues exist. Some patients with lower pole constriction may have a deformity from inadequate release and may still require release. This can be seen in the tuberous or constricted breast. Conversion of a subpectoral to a dual plane type II release can allow access to the deep surface of the gland for scoring to allow expansion. Animation deformities can exist with dual plane, total retromuscular, or partial retropectoral coverage. Total muscular coverage is virtually impossible without wide exposure and lifting the serratus off of the chest wall, which can be bloody, painful, and prolong recovery. Animation deformities decrease significantly with dual plane compared to traditional partial retropectoral pockets.

Management of coverage/parenchyma issues

The only reliable method of increasing soft tissue coverage is to convert from a retromammary to a retromuscular pocket. If the implant is already truly muscular, there is often little to do.

When retromammary

One must recognize that there may be difficulties and trade-offs when converting to a retromuscular position. If there is lower pole stretch, the new implant may still sit so low that little if any of it will end up behind the muscle. If NIMF is greater than ideal for the given implant size (7 for 200, 8 for 300, and 9 for 400), the surgeon must be circumspect about how much of the implant will gain coverage. If there is coexisting ptosis, then the surgeon should consider whether conversion to a partial retropectoral or dual plane pocket risks exacerbating the ptosis. Conversion to a dual plane pocket by dividing pectoralis origins along the medial inframammary fold can help obviate the problem of exacerbating ptosis, but if the envelope was very thin or stretched, it will not look as full.

Furthermore, if tissue pinch along the IMF is <5 cm and maximal coverage is necessary inferiorly, one may have to consider whether the benefits of a dual plane pocket outweigh the sacrifice in tissue coverage from division of the pectoralis origins along the inframammary fold. And when the muscle is taken down along the fold following a previous submammary augmentation, it often will window shade up higher than it would in a primary augmentation. That is because in a well-executed dual plane pocket created in a primary augmentation, the attachments of the pectoralis to the overlying gland help hold the muscle down to cover the inferior pole of the breasts. With these attachments completely eliminated by a subglandular pocket, there is nothing to hold the muscle down after division of the pectoralis inferiorly.

In fact, even without an inferior release, the caudal edge of the pectoralis can pull up superiorly in some cases. It can even create a band of tension over the

implant, compressing the implant superomedially where there is coverage, with the implant then bulging out inferolaterally where there is no muscle. These problems can sometimes be controlled by suturing the muscle up to the overlying gland. However, attempts at pulling the muscle down and holding it far inferiorly by tacking it to the overlying gland often result in significant deformity. An alternative therefore is to use marionette sutures as described by Spear. Finally, another option may be to use dermal grafts, such as AlloDerm® or Strattice™. Attached to the caudal edge of the pectoralis, surgeons are now trying to use these as an interposition between the muscle and the inframammary fold, not only increasing coverage through its own thickness, but mostly by drawing the muscle down to maximize muscle coverage.

One must also consider the potential for animation deformities when converting to a retromuscular pocket. It is difficult to assess, but it is my impression that these problems are more noticeable in the secondary patient switched from submammary to dual plane than in the primary dual plane patient. While one must consider a change to submammary pockets in any patient with significant deformity, one must reassess the litany of advantages of muscular coverage for that particular patient before embarking on a pocket switch, being certain that the advantages outweigh the disadvantages for that patient. In particular, it appears that the patients who most notice animation deformities, in particular deformities of dimpling and retraction of the skin, frequently have tissue pinch <2 cm, so the decision to change the pocket must be made judiciously. Patients frequently complain about inferolateral implant palpability and rippling, particularly when leaning forward or bending over. While conversion to a retromuscular pocket may be indicated for other reasons, the patient should be reminded that there is no pectoralis muscle in this area, and that this zone would not be expected to improve following a switch to a retropectoral pocket.

Particularly when coverage is very thin, and in all cases, for that matter, one must consider whether the implant size is appropriate for the patient's available soft tissue. There are times in which the coverage may be inadequate for the current implant size, but would be adequate for an implant of a smaller size. Unfortunately this is not always easy to determine. In the ideal situation, the primary surgeon documented the critical measurements to determine implant size pre-operatively (STPTUP, STPTIMF, APSS, PCSEF). These measurements can then be used to evaluate whether the patient's current implant size is appropriate for her tissues. It is uncommon to find even such basic information in previous records. The importance of these objective measurements in revision surgery is so great that it behooves all surgeons to document them before a primary patient's first operation. One can assess whether the base width of the augmented breast is being defined by the base width of the implant, or whether the natural base width is wider than the implant. If it is the former case, then visible edges or a lack of adequate coverage may be improved by selecting an implant that fits within the footprint of the breast.

When retromuscular

A great many patients with severe soft tissue inadequacy are already 'behind the muscle'. How can that be? Pectoralis coverage is dependent upon three things: its origins along the sternum, from the ribs along the IMF, and from its overlying attachments to the gland. When the origins along the IMF are divided, the attachments to the overlying gland hold the pectoralis down, allowing it to pull upwards only a centimeter or so from the IMF. However, if those attachments between pectoralis and the overlying gland are released excessively, the muscle will window shade up, substantially sacrificing coverage. This can intentionally be done in a precise and selective manner so that the muscle can rise to the lower border of the areola in a Dual Plane Type II, or to the upper border of the areola in a Dual Plane Type III, in response to specific clinical situations, such as glandular ptosis or a constricted lower pole.

It occurs quite frequently, however, in an unintentional manner during routine breast augmentation from one of two maneuvers. With the periareolar approach, there is disruption of these attachments as a result of the dissection path that may be taken from the areola to the IMF. Even with the best of intentions, even careful PA techniques can result in excessive vertical elevation of the pectoralis, thereby sacrificing coverage. It can also happen with the inframammary incision, if excessive dissection is done on top of the pectoralis before finding a way under it. Disruption of what seems like just a centimeter or two can result in

massive window shading of the muscle after the origins along the IMF are released and the muscle is put under stretch by an implant underneath. This sort of problem is usually non-existent with the transaxillary approach; while frequently one finds incomplete division of the pectoralis origins along the IMF with the TA approach, it would take tedious, intentional, and difficult retrograde dissection from the axilla to disrupt the connections between the pectoralis muscle and the overlying gland. It is therefore unlikely to ever see significant loss of muscle coverage following a previous transaxillary augmentation.

The submuscular patient with significant implant visibility problems represents the most difficult problem to correct in all of secondary breast surgery. If the pectoralis muscle is known to be fully intact, then there might not be anything to do. Perhaps in the future, tissue augmentation with fat or other injectables may be de rigueur, but at this point they are still being explored. If the pectoralis can be felt to have window-shaded superiorly so that the patient does not have adequate muscle coverage, the goal must be to pull the muscle back down over the implant. In some cases this may be exacerbated by the implant sitting low, and a procedure to either raise the pocket itself or a mastopexy may necessary in those situations.

The pectoralis muscle may often be thin and not a stout structure with which to place sutures. But every effort must be made to move it inferiorly to add coverage. The dermal substitutes Alloderm® and Strattice™ are also described for this purpose. By sewing them along the caudal edge of the pectoralis muscle, they can then be sewn down to the inframammary fold. The point is not so much to gain coverage from the material as to pull the muscle down as far as it will go, thereby increasing the surface area of the implant covered by the patient's own muscle.

Other parenchymal issues

In addition to lack of coverage, parenchymal maldistribution can create deformities. The ones most notable are the so-called double-bubble and constriction of the lower pole.

Double-bubble

The double-bubble occurs when the implant sits below the old inframammary fold. The presence of parenchyma above this line and the absence of parenchyma below it gives the step-off characteristic of the double bubble. This problem is more pronounced with pre-existing 'tight' inframammary folds, as such folds denote a sudden demarcation between the thick breast and much thinner upper abdominal tissue. What is double is the perception of the breast mounds: there is a mound from the device, and the original breast mound is perched on top of it, shifted superiorly to some degree.

The first issue is to assess whether the implant is of the right size for the breast. The larger the implant, the more the fold has to be lowered. If the implant is too large, switching to a smaller implant will allow the IMF to be raised, reducing exposure to the lower mound. Even a small raise of the IMF can dramatically reduce the perception of this deformity. If the implant must be lower than the original IMF, it is released with as many vertical scores on the deep surface of the parenchyma as necessary. One can feel when the release is enough, but sometimes this requires going all the way through to the dermis. It is easy to 'buttonhole' through the skin with this maneuver, so one must be very careful. But even with a maximal release, if the difference in thickness between the subcutaneous tissues immediately above and below the fold are great, and the transition sudden, there will likely always remain some visibility of the old inframammary fold.

If the implant is the correct size, one should check to be sure that the NIMF distance is appropriate for that implant. Sometimes, one needs just to raise the IMF (see section on pockets). But if the implant still needs to be lower than the old IMF, extensive scoring of the parenchyma to allow its redistribution may be necessary.

Lower pole constriction

Developmental constriction of the lower pole is quite common. Sometimes there is a true tuberous breast, but more commonly there may be horizontal tightness of the lower pole or maldistribution of the parenchyma centered just deep to the areola, resulting in an excessively projecting breast. Unless the implant was dual-plane or submammary and the parenchyma was scored, these problems often persist after the first augmentation. Such patients need to be converted to a dual plane from a partial retropectoral or total submuscular pocket, and extensive scoring of the lower pole of the gland needs to be undertaken.

Scoring:

1. Significant deformity and/or lack of tissue coverage (pinch < 1 cm)
2. Moderate deformity and/or lack of tissue coverage (pinch < 2 cm)
3. No deformity of tissue coverage.

Skin envelope

The problem

Many patient complaints and needs for secondary surgery relate to the state of the skin envelope. While there are some cases of skin deficiency related to constricted breast deformities or excessive prior mastopexy, the most common skin issues in the breast augmentation patient are stretch deformities with skin excess and/or ptosis. These include generalized laxity of skin with no ptosis (essentially an underfilled envelope), increased nipple to inframammary fold length with appropriate positioning of the nipple areola complex on the breast mound (bottoming out), and true ptosis (nipple–areola complex positioned low on the breast mound).

Small breasts age better than large breasts whether they are natural or augmented. The small A cup breast will frequently be as pert on a 70-year-old as it was when she was 20, albeit small. But almost every naturally D cup woman develops some ptosis by her late 20s, and the situation is frequently similar in the augmented breast. Whether breasts were initially sized by volume or dimension, each implant has a weight to it, and that weight exerts an effect on the breast skin that is often unpredictable. Though it would be impossible to ever expect to demonstrate this statistically, it is clear to every surgeon experienced with secondary augmentation that increased breast implant size is associated with greater stretch of the skin envelope. This is due to both the increased pressure of the projection of the implant and stretch on the lower pole of the breast due to the weight of the implant.

Women whose first operation was done following involution and/or glandular ptosis post partum or following weight loss are frequently found in this group. With skin stretched or thinned before their first operation, they frequently requested to be full again. Oftentimes their skin was not just stretched from lactation, but it developed striae and thinning, and lost some elasticity. The weight of the implant against their thinned skin can result in accelerated stretch. Many of these patients report that in hindsight their original surgeon initially suggested a mastopexy, but that they didn't want the scars. Instead, in order to fill their envelope, they may have received a larger implant than they wished, and in any case, any additional weight further stretched their skin out.

The secondary mastopexy augmentation patient is a category of secondary augmentation patients that deserves its own chapter. This subgroup of augmentation patients has a higher reoperation rate than primary augmentation patients alone, and the reason is obvious. Though it is done frequently, and is done for appropriate indications, it nonetheless is an operation that at its core is inherently illogical. By definition, the mastopexy-augmentation candidate has skin that failed to hold the pre-existing weight of the breasts. Even if due to a relatively short term event like nursing, permanent changes frequently occur to the skin. Skin is removed with a mastopexy, but the skin that remains is the same skin that gave out once, and under the influence of greater weight, it can be expected to stretch again.

Assessment of the skin envelope

In the primary augmentation patient, measurement of skin stretch by pulling forward on the medial border of the areola to see the maximum amount the skin can be distracted has been described and is de rigueur for many surgeons. This can also be done in an identical manner on the augmented patient and documented. Absent quantified, documentable numbers, information cannot be recorded for the benefit of the patient, and surgeons cannot discuss amongst themselves in order to further medical knowledge.

It is important to assess the quality of the skin and its potential to stretch. It is unfortunate that we do not yet have an accurate way to either quantify or predict that potential. But even rough assessments are important. For instance, it is important to point out striae and obviously thin tissues to patients, so that they specifically understand that these are issues inherent to their tissue that the surgeon cannot improve. One of the most important parameters to be measured and documented is nipple to inframammary fold distance. The rule of 7 cm, 8 cm, and 9 cm has been published and is a reliable indicator of the ideal distance for implants of 200, 300, and 400 mL respectively. A special note must be made about patient request for

upper pole fullness. A common request of the secondary augmentation patient is to have more upper pole fullness. Unless the patient's lack of upper pole fullness is due to placement of an implant that is small relative to the patient's breast tissue – which is uncommon – the problem is likely due to a stretched lower pole.

The breast fills from the bottom up, just like a bucket being filled with water. The greater the lower pole laxity, the greater the volume it will take to fill the upper breast. But the surgeon should rarely expect to gain long lasting upper pole fill by filling the lax breast with an ever-larger implant. This poor decision is frequently made. While this can gain short-term improvement in upper pole fill, if the lower pole is stretched, it frequently restretches even worse than it was before, resulting in a one-step forward and two-step backward situation.

Sternal notch to nipple is also a helpful measure of asymmetries, but is not an absolute indication of whether a nipple needs to be moved superiorly. In the augmentation patient, the issue is the position of the nipple–areola complex relative to the breast mound and its axis relative to the horizon. If a nipple–areola complex is low on the breast mound or pointing down, one must determine first whether the breast mound is in the right place, or if the mound is high. A high riding implant can simulate ptosis; similarly an implant that is positioned too low can give the nipple–areola the appearance of being too high. Capsular contracture can also pull an implant superiorly, giving the illusion of a low nipple–areola complex, and treating the contracture at times can create a proper relationship of the nipple to the breast mound. A partial retropectoral pocket that holds an implant too superiorly can similarly make the nipple look low on the mound, as can too large an implant for the NIMF distance. One must be alert to all of these possibilities when assessing the skin envelope of an augmented breast.

Solution

Patients rarely like the solution for skin envelope problems, which is typically some sort of mastopexy. Many pursued augmentation for cosmetic reasons, and accepting significant scars on the breast are anathema to them. If they are necessary in the surgeon's judgment, the surgeon must document this advice clearly, and explain to the patient the ramifications of forgoing the mastopexy. Legal documentation aside, it would behoove the surgeon to either not operate on someone unwilling to undergo the proper procedure, or at least be certain that the patient really understands the limitations of not undergoing the entire procedure as the surgeon sees fit, as the disappointed secondary augmentation patient can become quite a significant emotional liability. But there are many patients who prefer to have 'somewhat droopy' breasts to having perkier but scarred breasts. It seems that many patients who need a mastopexy frequently fail to see what their breasts will look like without a mastopexy. It is important to make it clear to them that they will have larger breasts that hang lower on the torso. The importance of discussing these issues with patients cannot be stressed enough.

It is often very difficult to assess the extent and pattern of skin redundancy when there are implants in place. There may be asymmetry, and it is often unclear whether this predated the surgery or is a result of it. Oftentimes, patients with stretch deformities are post-partum, and their baby may have favored nursing on one side and this contributed to the asymmetry. Coexisting capsular contracture can make assessment of the skin envelope difficult, as contracture can draw the implant up, itself causing a difference in SNN and N:IMF measurements. Asymmetry in contracture can create an apparent asymmetry in nipple height. One should embark on correcting both of these in one stage only if you are extremely experienced and confident that you can deliver a result that will meet that patient's expectation. There are some patients who are tolerant of some asymmetry in NIMF distance, nipple height, or upper fullness. Others will only be happy if it is perfect. One should always at least consider first correcting the contracture, and then allowing skin to settle and redrape before assessing for and planning mastopexy. This is particularly true if there is a volume disparity or a disparity in the extent of contracture, which can make planning a precise mastopexy very difficult. It is true that patients can be sat up on the operating table for marking, but in my opinion, these markings are sometimes not as precise as if they were made with a patient standing preoperatively, with the surgeon able to stand back and assess, mark, and remark as necessary. If nothing else, this also provides a greater margin of safety for the blood supply to the nipple–areola complex.

8 Secondary augmentation

A very useful technique for assessing ptosis in saline patients is to do a preoperative deflation. Used when one knows that there is ptosis, but is unable to assess its extent, it is simple to use an angiocath to drain both implants. The underlying asymmetry of both volume and of the skin envelope can then be revealed. Without the pressure of the implant, the skin will rebound to a varying degree. Though most patients want to be deflated as close to the time of surgery as possible, the rare patient who is willing to go deflated for several weeks or more often sees a greater degree of rebound contraction of the skin, allowing for a more precise preoperative planning of the mastopexy, or in circumstances revealing that a mastopexy is not even necessary. It is certainly acceptable to not deflate these patients and do the surgery all in one stage, but by informing the patient that it can be safer and more accurate to do it in a staged manner, the surgeon has legitimately transferred responsibility for a less than perfect result to the patient, and, given the difficulty in creating a perfect result in these patients, this is a very important thing to do.

Treatment options

The first priority is to define whether or not the breast mound is in the proper position. If the implant needs to be moved up or down, that needs to be considered before one considers tightening the envelope or raising the nipple–areola complex. When determining the appropriate mastopexy, one must be specific about the area of excess of the skin envelope and resect accordingly. There is no mastopexy that is ideal in all situations. Start by defining what needs to be changed, and that will guide you to selecting the proper mastopexy.

If the NIMF is long relative to the breast width, then a horizontal scar will likely be necessary to adequately shorten it. Periareolar and vertical mastopexies have only a limited ability to shorten the NIMF distance. By definition, any patient that has implants and needs a mastopexy has skin that is compromised. Though the mastopexy removes skin, that which remains is the same skin that stretched the first time. I have seen many mastopexy augmentations with the periareolar or vertical scars, and though there are situations in which these may be satisfactory choices, they do tend to stretch more with time in these circumstances than does the inverted T pattern mastopexy.

If the breast is wide or needs projection, it will need a vertical scar. A periareolar scar reduces projection; in fact, that it why it is so useful in a tuberous breast. But when applied to the typical atrophic and ptotic augmented breast, it overly flattens the breast, reducing often-needed projection. Sometimes the nipple position is adequate for the mound, and so no circumareolar incision is necessary. In rare cases, it is possible to just do an elliptical incision within the inframammary fold to shorten the NIMF distance, though this typically cannot shorten it more than several centimeters. If there is horizontal laxity or if more projection is needed, then a vertical scar will be necessary. Though this is typically done together with a circumareolar incision, it is possible to make the vertical limbs converge at 6 o'clock on the areola, eliminating the periareolar incision.

In the augmented breast, one would be wise to restrict the use of the donut mastopexy to cases in which the areola just needs to be reduced, there is a minor amount of generalized skin envelope laxity without ptosis, or for correcting ptosis in small, light breasts, with small implants. This incision is not adequate for significant excisions or raising of the nipple–areola complex in most situations. The most important aspect of this discussion is to recognize the risks involved in doing a mastopexy on the augmented breast. Even a submuscular implant reduces blood supply to the nipple–areola complex, and a submammary implant probably reduces it even more so. Always assess the thickness of the skin envelope. Augmentation patients who need mastopexy frequently have extremely thin tissue, and one must be exceedingly cautious in preserving the blood supply. Undermining should be kept to as little as necessary to pull the skin together.

If a capsulectomy is being done at the same time, one must be exceedingly cautious in performing a mastopexy, and there are many situations in which this should not be done, as each procedure can damage the blood flow to the nipple–areola complex from both the superficial and deep surface. Handel's landmark paper on this subject is a must read for any surgeon performing this surgery. Markings should also be made much more conservatively than they would doing a mastopexy in a similar sized breast that is not augmented, as the tissue over the implant does not mobilize and slide to the same extent as it does in the non-augmented breast. Occasionally patients with

contracted implants request a mastopexy. This can be an extremely challenging situation, as the overlying tissue is often very restricted in its movement, and mobilizing enough laxity to allow closure of even a conservative mastopexy excision can be problematic.

Scoring:

1. Significant ptosis, N:IMF > 11 or APSS > 4 (with implant in place)
2. Ptosis, N:IMF > 9.5 or APSS > 3
3. No disorder of skin envelope.

Capsular contracture

While capsular contracture remains the most common reason for revision surgery in published data, the use of antibiotic irrigation solution and relatively bloodless surgical technique have made this an increasingly uncommon phenomenon. Patients and surgeons must understand that Grade II 'contractures' are non-pathologic, and do not require revision. Only III or IV contractures that are distorted or painful require or warrant surgery. There should be no expectation that a II can ever be converted to a I over the long term, and patients without distortion or pain should not have surgery only for reasons of the capsule.

Assessment

In an era in which many American patients had augmentation with saline implants, which were commonly overfilled, one should be cautioned to be mindful of implants appearing distorted and feeling contracted which in fact are merely over-inflated saline implants. In particular, over-filled high profile saline implants can quickly adopt a very spherical shape and feel quite firm, which can be indistinguishable from a Grade III contracture. The McGhan Style 468 implant was designed with published fill volumes that were themselves adequate, and so the implant was not intended to be overfilled. If overfilled, this implant also became particularly hard, mimicking a contracture. One may not be able to discern this until the capsule is exposed at surgery, and though the surgeon may still choose to do a capsulectomy, in fact any improvement in shape or feel may be due less to the removal of the capsule than converting to an implant that is itself less spherical and less firm.

One must also be aware that a capsular contracture can act somewhat like an internal bra, pulling the breast tissue up and in, concealing a true state of ptosis. Many a dissatisfied high, hard, and round contracted patient has been converted to a much more dissatisfied low, soft, droopy and even rippled patient after satisfactory correction of the contracture, but with reveal of the previously occult ptosis. It is impossible to describe exactly the patient in whom this is a risk, but it is most commonly noticed in patients in their 50s or older who have lactated, lost weight, and have sun damage or striae on their breast skin. Whether or not this is the case, and the extent to which a patient might droop after the capsulectomy is too unpredictable for one to choose to do a mastopexy at the time of capsulectomy, as well as the fact that it may be hazardous to the blood supply of the breast.

In assessing the patient for improvement in capsular contracture, one must look to see what can be done differently than the last operation that led to a capsular contracture; if plan A failed, make sure that plan B is different than plan A. In order to improve capsular contracture, each of the following must be considered: bloodlessness and overall skill set of initial surgeon; use of antibiotic irrigation; textured vs smooth implants; premuscular vs retromuscular; periareolar vs IM or TA incisions; history of infection in the breast; whether previous implants are or are not either saline or low-bleed silicone implants with a barrier shell; if it is a tertiary, whether previous capsule was given a complete capsulectomy and drained. If every one of these things was executed in the previous surgery, and the surgeon has nothing different to do, the patient should be advised that they should either live with the implant as it is, or to be explanted without reimplantation. Patients and surgeons should be loth to embark on a revision for capsular contracture if there is no room to do something different than has been done before.

Treatment

The workhorse treatment for capsular contracture is the complete capsulectomy. Since a substantial body of evidence suggests an infectious etiology to contracture, a capsulotomy, which leaves capsule behind, should not be viewed as a definitive treatment for capsular contracture. Capsulotomy should be reserved for opening up areas of either closed off or underdissected pocket that are preventing an implant from occupying its intended position.

8 Secondary augmentation

Capsulectomy for capsular contracture should be done as bloodlessly as possible, and the new implant should not be placed until fastidious electrocautery hemostasis has been completed. The superolateral portion of the capsulectomy almost always tends to be the most difficult to dissect with excellent hemostasis, owing probably to a combination of reduced visibility in that area and an abundance of muscle perforators. One must avoid the temptation to use excessive distracting forces on the capsule at this point which can result in tearing of blood vessels which stain tissues with blood, leading to a difficulty in visualizing the vessels, as well as increased post-operative pain and potentially inflammation that can lead to a recurrence of the capsular contracture.

The pocket should be thoroughly washed of all debris with antibiotic solution, and the antibiotic solution should be allowed to sit within the breast in an attempt to sterilize it. If there is any fluid observed around the implant, it should be sent for culture for aerobes, anaerobes, acid fast and fungi, with instructions to hold the culture for at least 3 weeks and consider plating on enriched media if there are PMNs on the Gram stain or the surgeon has a suspicion that there may have been a contamination, perhaps owing to a slightly inflamed capsule, or the quantity or color of fluid. If cloudy fluid is found, the surgeon should consider not placing any implant. All implants carry labeling that restricts them to single-use. An implant that develops a capsular contracture should therefore not be reused, even in the same patient. Furthermore, since bacterial contamination is a possible etiology, it would be illogical to use the same prosthesis again. And the shell may have been weakened from the contracture or trauma at the time of the initial surgery, and it makes sense to use the opportunity of having a patient asleep with the capsule opened to start afresh with a new device. This has always sounded inherently logical to me, but I continue to see patients who had their implants removed and the same ones replaced in the setting of capsular contracture.

Retropectoral capsulectomy

If the previous implant was already retromuscular, one must be very cautious dissecting the posterior wall of the capsule. The posterolateral wall usually can be dissected easily, owing to the pectoralis minor and serratus muscles, which are deep to it. This creates an easy plane of dissection in which there is not a lot of adherence, as well as being a layer of protection over the rib cage. The inferomedial portion is usually the most adherent to the chest wall, unless the capsule itself is extremely thick or calcified. While a pneumothorax is a risk even with the most carefully executed capsulectomy, the surgeon should remind him or herself that no additional removal of capsule warrants increasing the risk of pneumothorax. In the case that safety requires a subtotal capsulectomy, then the remaining capsule should be desiccated with a cautery in an effort to maximally sterilize it. When dissecting over the anterior wall of the capsule, one usually finds that the dissection becomes more difficult when one dissects deep to the muscle, as often the capsule seems to thin or becomes more adherent to the muscle than it had been to the parenchyma inferior to the caudal free edge of the muscle. That muscle coverage may be very important to that patient, so one must use great caution in preserving all the muscle fibers possible, taking pride in submitting a specimen to the pathologist as free from muscle as possible.

Neoretropectoral pocket

Another option to consider with submuscular capsules is to do a neoretropectoral pocket dissection. By dissecting behind the muscle and in front of the old pocket, the implant does not come into contact with the interior of the old capsule, and has fresh tissue around it. I have done this when the capsule is restrictive enough that I want to create a new space, but where the dissection of the posterior wall off of the chest would not be technically feasible without entailing risk of damage to intercostal muscles, or when the capsule is too intimately associated with the ribs to actually be removed from them. This has also proved valuable in the uncommon but hardly rare situation of a capsular contracture in a medially, laterally, or inferiorly malpositioned implant. If a complete capsulectomy is done in such patients, there is often little tissue left behind of sufficient durability to hold capsulorraphy sutures. But the neoretropectoral pocket allows for both the creation of a new space for the implant as well as closing off the previous malpositioned space.

Submammary capsulectomy

Subglandular capsulectomies tend to be much easier, perhaps because these capsules often seem thicker, but

more importantly because their anterior wall does not need to be freed from adherence to the deep surface of the pectoralis and the posterior wall is protected by the pectoralis, allowing an easier and safer plane of dissection; the posterior wall of a subglandular capsule is rarely as adherent to the superficial surface of the pectoralis as is the anterior wall of a submuscular capsule to the deep surface of the pectoralis. Again, one must avoid resecting muscle fibers along with the posterior wall, and surgeons should pride themselves on avoiding as much muscle as possible with the specimen.

If the contractures occurred with subglandular pockets, the patient should be urged to consider retromuscular pockets. One must be aware when converting from subglandular to submuscular pockets, that there is no overlying parenchyma to hold the caudal edge of the muscle inferiorly. Particularly if the pectoralis is released along the inframammary fold, which often is necessary, the pectoralis can window-shade high superiorly, often reducing the extent of muscle coverage to a small medial and superior area. If the lower pole of the breast is stretched, one can do all of this and find the patient with the muscle completely above the implant. Since the attachments along the inferomedial fold are critical to holding the muscle down, one must be more judicious about taking them down than in a primary augmentation, discussing with the patient possible implications for a high-riding implant or greater animation deformity. In particular, there must be no separation of any pectoralis fibers off of the sternum in this situation. Even the smallest division of pectoralis off of the sternum can permit excessive cranial malposition of the caudal border of the pectoralis. One must also consider marionette sutures to hold down the muscle as described by Spear, tacking the muscle up to the overlying parenchyma to maintain coverage, or using Alloderm®, Strattice™, or another tissue matrix, as an extension of the caudal edge of the muscle to be sewn along the inframammary fold, thereby preventing excessive window shading of the muscle and maintenance of optimal muscle coverage of the lower pole of the breast.

The role of devices

New devices may themselves offer some improvement in reduction of capsular contracture. Saline and low-bleed silicone with barrier shell technology seem to have roughly similar contracture rates, below those of earlier-generation silicone gel technology. The lowest rates have been shown with the highly cohesive form stable implants, but no direct comparison in similar groups has been done between them and responsive silicone. Texturing may offer some advantage to smooth implants, perhaps most significantly if the implant is placed in the submammary position. So long as the issue of texturing remains unresolved, the option of placing a textured implant should probably be at least discussed with any patient having an operation for capsular contracture.

Pharmacologic agents

Much has been made of montelukast and zafirlukast, but as of this date, there is not enough conclusive data to suggest what would be an off-label use of these agents for this use, particularly in light of significant risks associated with them. However, for the properly informed and consented patient who wishes to try everything without surgery, these may still be reasonable management options. While the risks are uncommon, they are very severe. Even their advocates suggest their use in early capsules only; the treatment for an established capsule is surgery.

Incision choice

Periareolar incisions usually require transecting the breast parenchyma, which contains the same bacteria that have been implicated in capsular contracture. Many patients with previous PA incisions refuse IM incisions, and the possible trade-off in avoiding bacterial contamination should be discussed with them. The evidence is not compelling enough at this point to make PA incision at all unacceptable, but theoretical considerations are sufficient for patients to be suggested to consider the IM incision.

Antibiotic solution

I use Adams formula whenever performing breast augmentation (50 mL povidone iodine, 1 g cefazolin, 80 mg gentamicin in 500 mL physiologic saline). FDA product labeling restricts povidone iodine contact with implants, so patients sign an off-label consent. The data clearly shows this solution to be extremely powerful in reducing capsular contracture. For the

surgeon who does not want to use povidone iodine, 50,000 units of bacitracin can be used as a substitute. Either solution should be used liberally for irrigation throughout the operation.

Drains

Most surgeons suggest draining even the driest capsulectomy, as a significant amount of serous fluid can accumulate in these cases. If nothing else, removal of this fluid makes patients comfortable by limiting the swelling they have, but it stands to reason that removal of blood and debris around the implant may help in reducing contracture in patients who are likely to ooze following a capsulectomy.

Sterility

Capsular contracture is the end result of inflammation. There are many causes of inflammation, but there are several we can reduce. Probably the most potent source is low-grade bacterial contamination. Blood, debris, and unnecessarily traumatic technique all contribute to inflammation. All implant surgery must be done with this in focus in the surgeon's mind.

Scoring

1. Severely distorting or painful contracture.
2. Moderately distorting contracture.
3. No clinically significant contracture.

Pocket position

It is of course impossible to know exactly the position of a pocket by observing a patient externally. This division puts into one category all causes of implant malposition. Since an implant sits wherever the pocket is, implant malpositions can best be thought of as pocket malpositions. Implants can be malpositioned inferiorly, superiorly, medially, or laterally.

Medial malposition

A mild medial malposition can be seen as one implant sitting closer to the midline than the other. In the most severe case, the implant can cross the midline and the presternal skin can be lifted off of the sternum, creating symmastia or the so-called 'uniboob' deformity. This is often associated with an inferior malposition. Medial malpositions almost never occur passively; they usually are the result of excessive medial dissection, with the notable exception of patients with pectus excavatum, the angle of whose chest wall allows gravity when the patient is supine to cause excessive medial migration of the implant.

Inferior malposition

Inferior malpositions are frequently referred to as 'bottoming out,' though for clarity I prefer to use the term 'bottoming out' to describe lower pole stretch deformities as characterized by an increased NIMF distance with appropriate fold position. This can coexist with inferior implant malposition or can exist alone. However, many surgeons use 'bottoming out' to describe inferior malposition, and there is no standardized nomenclature with which to set the record straight. It may be the result of improper determination of the inframammary fold, or of the implant lowering beneath the intended fold. No matter the terminology used by the surgeons, the approach to treatment and expectations for correction are different between NIMF stretch problems and an inferiorly displaced IMF.

Superior malposition

Superior malpositions are of several types. Capsular contracture itself frequently causes the contracted implant to displace superiorly, resulting in an inadequate fill of the lower pole of the breast and a prominent upper bulge. Failure to adequately dissect the lower pocket can also result in a superior malposition. One of the frequent causes of this is failure to accurately take down the pectoralis along the inframammary fold. Though this can happen with any incision, it seems to happen frequently with the transaxillary incision, particularly if it is done blunt and blind. The triad of upper bulge, animation deformity, and high inframammary fold is almost pathognomonic for a transaxillary augmentation with imprecise release of the inframammary fold.

Another cause of superior malposition is failure to lower the inframammary fold appropriately for the size of the implant that was placed. But it is possible for even the most perfectly dissected pocket to fill with fluid in the early post operative stage and close itself off. There is a dead space at the bottom of every pocket, and it can close off, causing a 1-1.5 cm superior dis-

placement of the implant. A tight or misplaced bra may contribute to this problem. Constricted lower poles that were not properly expanded at the first operation by dual or subglandular plane positioning with parenchymal scoring can result in inadequate lower pole expansion and fill, resulting in what appears to be a high-riding implant. Finally, one must remember that a breast fills from the bottom up. Any device that is too large for the breast envelope or is too large relative to the NIMF, will appear high riding for that breast.

Lateral malposition

Lateral malpositions can be the result of dissecting an excessively wide pocket, but it can happen passively due to the shape of the chest wall over time. For this reason, lateral dissection in primary augmentation should never proceed lateral to the lateral border of the pectoralis minor. Far too often, surgeons dissect to the lateral border of the breast. Dissecting to the lateral border of a 14-15 cm wide breast makes an excessive lateral pocket almost every time. Other than a symmastia patient, no patient ever complains of too much cleavage, and even small incremental increases in lateral dissection at the primary augmentation can result in significant lateralization with time. For this reason, patients will frequently describe this problem as increasing over time. It is often associated with somewhat of a barrel- or pectus-carinatum-like shape to the chest, in which the sternum is far anterior to the anterior axillary line, creating a steep slope along which the implant falls laterally when the patient is supine, stretching the lateral tissues and even gradually enlarging the pocket laterally. Patients must be reminded that their implants do not sit on a flat surface; in fact, for all patients, but to varying extents, when they lie on their back, their two sides of their chest are like the roof of a house, and the natural tendency is for the implants to fall to the sides when they are supine, and even to some extent when they are upright.

Some patients with implants complain that when they lie supine, their implants do not fall laterally in the same way as do natural breasts. Yet, other patients with implants that do fall laterally complain that their breasts do not maintain anterior projection when they are supine. Much of this is due to the shape of their chest, and patients in both camps need to be counseled as to the reality of their situation.

Treatment

Start by marking where the pocket should be. I usually start by determining the ideal NIMF distance for that breast width, and then draw over the breast were I want the borders of the implant pocket to be. There may be zones where the new pocket extends beyond the existing pocket, and there may be areas in which the existing pocket extends beyond where the new pocket should be. So there will be areas where you will want to close off the pocket, and perhaps others where you will want to open the pocket. Opening the pocket is the easiest, as it usually only requires a capsulotomy. Closing off an area of undesired pocket is more difficult, and this requires either a capsulorraphya site change, or creation of a neosubpectoral pocket. Releasing the capsule often in and of itself often allows more pocket to open up than one might anticipate. After the capsule is incised, try placing a sizer before dissecting, as there is frequently enough stretch for the pocket to open adequately without significant dissection.

Capsulorraphy

The capsulorraphy is the gold standard for reduction of one or more dimensions of the pocket. External markings of the desired extent of the pockets are transposed to the anterior wall of the capsule by using angiocatheters along the proposed borders of the pocket. A cautery device is used to mark each of the sites of the angiocatheter and then to connect them into a smooth curve. This line is then transposed onto the chest wall. Depending upon the quality of the tissues and the amount of space to be eliminated, the area to be obliterated can be sewn to itself or a capsulectomy of the proposed area of the pocket to be closed off can be resected, with a running permanent suture placed along the entirety of the new pocket. A capsulorraphy can provide excellent results, but so too can it be tedious, requiring the suturing of thin tissues, particularly inferiomedially along the chest wall. Sutures often need to be placed, removed, and repositioned. One must be careful when transposing the marks on the inside of the anterior wall of the capsule to the chest wall, as there is a tendency to transpose these marks superiorly, resulting in superior implant displacement. There can be early irregularities and over correction following a capsulorraphy.

Neoretropectoral pocket

The neoretroepectoral pocket was original described by Heden as a means to reduce the dimensions of a submuscular pocket to fit an anatomically shaped implant in order to reducet he likelihood of rotation in a secondary augmentation. Spear and Maxwell have popularized the use of this procedure for reduction of enlarged pockets in difficult secondary augmentation situations.

This procedure works when the implant is already subpectoral, the space is over-dissected in one or more dimensions, and the surgeon wishes to remain in the subpectoral position.

The operation starts with marking of the proposed new borders of the pocket. Dissection starts along the anterior surface of the implant, much the same as one might begin a capsulectomy. However, in this case, dissection stops when the surgeon reaches the preoperative markings. The pocket is therefore only as large as the surgeon wishes it to be, and the limits of it are limited by the dense fusion between the capsule and overlying breast. The implant is removed, the anterior wall is tacked to the posterior wall and everal small capsulotomies are made in the now collapsed anterior wall to prevent accumulation of fluid in the old pocket.

This powerful tool works wonders for medial, inferior, and lateral implant malposition. The advantage over capsulorraphy is the speed and ease of dissection, the avoidance of the need to place multiple sutures into areas of often weakened tissues, and what appears to be a smoother and more accurate pocket border. Perhaps because of the absence of multiple sutures, these patients also seem to have less pain than capsulorraphy patients. It deserves emphasis that most patients with inferior, medial, or lateral malpositions have a thin and non-restrictive capsule. It is often difficult to perform a capsulectomy on such thin capsules, and such capsules, particularly posteriorly, are often too thin to provide the surgeon confidence that their capsulorraphy sutures will hold. In contrast, with the neosubpectoral pocket, it is the "lamination" of the capsule to the breast that determines the limits of the pocket.

Neosubglandular pocket

If there is an enlarged pocket in the subglandular position, the surgeon would typically make a submuscular pocket. But if there is some reason that it is elected not to do this, then a neosubglandular pocket can be made.

This follows the same principles as the neosubpectoral pocket, except that in this case the new pocket is between breast and anterior wall of capsule, rather than between muscle and anterior wall of capsule.

Site change

The easiest way to deal with a pocket malposition is to create a new space, e.g. converting from submamary to dual plane or dual plane to submammary. But oftentimes there was good reason to have initially made a submuscular pocket, and if the surgeon wishes to preserve that pocket location, then a capsulorraphy or neosubpectoral pocket must be done. More frequently, there is less reason to maintain a submammary pocket, and conversion to a dual plane pocket can help correct pocket malpositions. One should be reminded, however, that there is no muscle at the lateral border, so conversion of submammary to submuscular, or submusuclar to submammary, will not in and of itself correct lateral pocket malposition. In the case of inferior malposition, one must be careful when converting from submammary to submuscular what is done with the origins of the pectoralis along the inframammary fold. These precious fibers are what will hold up the implant, and they typically should not be divided in this situation.

Scoring

1 Significant deformity from implant malposition.
2 Moderate deformity from implant malposition.
3 No deformity from implant malposition.

Device

This is listed as the final cause of revisions as PMA studies consistently demonstrate similar rates of revision surgery across various implant types. If clinical trials of quite different devices yield similar revision rates, then the causes of the revisions have more to do with surgeons' processes and patient's expectations than it does with the devices themselves. Just by the statistics, soft tissue coverage, skin stretch, implant malposition, and capsular contracture are far more common causes of secondary breast surgery, and

addressing them at the time of revision surgery is far more important than device changes. It is important for surgeons, patients, and manufacturers to distinguish problems that are caused and solved by the device as opposed to other factors.

But since we are talking about revision of breast implant surgery, there is understandably significant focus on the breast implant itself. While frequently there are issues related to the breast implant, and sometimes the breast implant itself can be the driving force for the operation, the surgeon should think about optimizing all of the other factors in every revision case. No device change should ever be relied upon to fix an unsolved problem in any of these other arenas.

Scope of device-related issues

Size

Revision for size is the most frequent device related problem reported in clinical trials. Fortunately, this is a problem that is easily solved, if, at the time of the first operation, patient education is such that patients are made to understand that the goal of the operation is to fill their breast envelope rather than to achieve an arbitrary size determined by their whims, then operation for size exchange will always be inherently illogical.

If sizing at the time of the original surgery was based upon subjective criteria only, e.g. 'how big do you want to be?' then that patient has been set-up to reconsider her size repeatedly in the future. When a prospective primary augmentation patient is taught to ask for and expect whatever size she wants, then she thinks that size selection is arbitrary, and that all sizes are possible. If dissatisfied with her size later, she can always blame herself or her surgeon for her size, and reconsideration of her size choice is a matter that is always on the table for her.

Any sizing method that requires a patient to make a choice based upon her wishes rather than her tissues requires her to second guess her later choice. Any sizing method that relies upon the surgeon's intraoperative impression of what most fulfills his or her understanding of the patient's wishes rather than her tissues, further extends the concept that sizing is subjective, which opens the door for future reconsideration of the initial size choice. Parenthetically, intraoperative sizing risks putting responsibility for the implant size on the shoulders of the surgeon, risking that the patient blames the surgeon for her final size.

If a patient is taught that there is an ideal implant size for each breast, and if she selects that size, then theoretically reoperation for size exchange should never happen. Prospective patients do understand the concept that there is a limited range of volume that can be accommodated in their breasts, and that a smaller volume results in an empty upper pole, and that a larger volume results in a bulging upper pole, an unnatural look, and more parenchymal atrophy and skin stretch with time. When patients understand and sign off on this at the time of the primary operation, they rarely will request either a downsize or an upsize at a later time. In reality, however, few patients are taught this or understand this at the time of the first operation, so the surgeon performing secondary augmentation will frequently see patients requesting size changes who did not understand these issues prior to the first surgery. It is the secondary surgeon's role to educate them about these issues.

Unfortunately, there is a pervasive myth that patients always wish that they were larger, and as a result, they are told to request an even larger size than they desired at the first operation. Nothing can be further from the truth. There are many patients distressed that their implants look larger and more fake than they had originally wanted. In fact, feeling self-conscious about size and feeling leered at by others is much more emotionally disconcerting than being happy with enlarged breasts, but merely wishing that they had been enlarged even more.

And the women who wish that they were larger have not suffered any permanent damage to their tissue. But women who were made larger than ideal for their tissues frequently have parenchymal atrophy, skin thinning, concavities in their rib cage, and skin stretch that may not be at all correctable, may require several surgeries, or may require significant mastopexy scars to correct.

Assessing the potential for size change

One of the difficulties is that breast measurements from the time of the first operation rarely can be found; and at times, even records of the implant size are difficult to find. While there are methods to accurately determine ideal implant size at the time of the first operation, there are no such methods described for assessing the appropriateness of size of an implant for a breast that has no preoperative measurements. This is criti-

cally important. The secondary operating surgeon must take into consideration the patient's request to be either larger or smaller, and assess the breast for the appropriateness of current fill, and the possible response of the breast to a greater or lesser amount of fill.

The first priority in this matter is tissue coverage. If visually the implant borders are already visible through the skin, then coverage with the current volume is already inadequate; such a patient should be considering a decrease in size, if any change is being considered. If coverage anywhere over the upper pole of the implant is <2 cm and anywhere along the medial border or IMF is <1 cm, the patient should be informed that their tissue coverage is already thin, and that a further increase of implant size would thin this coverage even more.

Next, the degree of fill of the existing breast envelope should be assessed. A concave upper pole would suggest the potential for adding more volume, and a convex upper pole would suggest that the breast envelope is already over-filled. Skin stretch can be measured and documented exactly as in the primary breast augmentation patient. Stretch <1 demonstrates that there is no additional capacity for volume, but stretch >2 does not necessarily mean that there is usable capacity; it might indicate that the skin is damaged and already excessively stretched and without good elasticity. In fact, many breasts with implants already >500 have >2 cm of stretch due to underlying damage to their skin either from pregnancy or weight loss, or from the device itself.

One of the most critical measurements is NIMF. A frequent complaint of patients asking to go bigger is not size per se, but wanting to achieve more upper pole fill. A larger implant is rarely the answer for more upper fill. The breast fills from the bottom up, so even a slightly increased NIMF distance creates a volume capacity in the lower breast which can steal volume that otherwise would have filled the upper breast. Using the ratios already mentioned (7,8,9 : 200,300,400), if a long NIMF is encountered, the solution should be shortening it rather than increasing volume. In some cases this may be due to an inferiorly malpositioned IMF necessitating superior pocket repositioning, or it may be stretch of lower pole skin, which requires a mastopexy. Though the theoretically correct fix for such a problem, the skin of a patient that has once stretched enough to require a mastopexy is at significant risk for restretching following the procedure. The extent to which the skin will restretch is difficult to predict, but the patient considering mastopexy in this situation must be told that upper pole fill cannot be guaranteed as the skin may stretch again to an unpredictable extent.

Patient wishing to go larger

If we have the records and realize that the patient was properly sized, then the patient requesting to go larger should be counseled about the effects such a choice might have on her tissue. Sometimes, however, a patient chose to go smaller than was calculated as ideal for her tissue for fear of being too large; this is the one situation in which going larger is indeed appropriate. Unfortunately, the most frequent request for going larger seems to be from patients who have already gone too large for their tissues, and their goal is often not just size per se, but filling up their ever-increasing stretched skin envelope. Such patients are on a slippery slope, not unlike the pattern we have all experienced when we pushed a sweater up our forearm and the elastic of the wrist gave out; we push it progressively higher and it stays tight for a short time, but ultimately we keep pushing it up higher and higher, until it is above our elbows and unwearable.

Some surgeons argue that they will only do a size exchange if it is for a change of more than a certain amount of volume, arguing that a small change isn't worth the surgical risk. Others argue that it is more logical to make the least change possible to an implant that is already appropriately sized. While it may not seem worth the risk and expense to add 30 or 50 mL to a breast, that may actually be more logical than adding 100 mL or more to an already full breast, increasing all the tissue trade-offs already discussed. In either case, this relatively simple decision can be one of the most difficult ones in all of secondary breast augmentation surgery. A large number of these patients seem unhappy: if they do not see a big change, many patients are happy. If they do see a big change, with time tissue consequences increase. Careful documentation of all discussions and decisions must be made, and the surgeon should only proceed after being convinced that a logical plan has been determined.

Patient wishing to go smaller

Years after their augmentation, there are many patients who wish to go smaller. Some say that they were

always larger than they wanted to be; others say that while the size was appropriate for them at a younger age, at this point it seems too large. Unlike size exchange to go larger, this carries with it no specific new adverse soft tissue consequences, other than perhaps revealing stretch deformities that were masked by the fill of the larger implant. It is difficult to predict who will and will not need a lift following exchange with a smaller implant, but it is a subject that should be discussed. The only drawback is less upper pole fill and a greater degree of emptiness. Patients often ask whether they will droop, and once again the NIMF distance is the most accurate predictor of this phenomenon. If the NIMF is longer than ideal for the new implant size, the surgeon should consider whether it is due to an inferiorly displaced inframammary fold, or if it is due to a stretched lower pole, and deal with those issues accordingly. Sometimes a patient requests to go smaller not so much because of volume per se, but because of the breast having too much upper bulging. In such a situation, evaluation of the NIMF should be evaluated to see if it is short, and the origins of the pectoralis along the medial inframammary fold should be evaluated to see if they are intact. If the NIMF is proportional for the current implant, and the patient is going smaller, one should consider raising the IMF to suit the smaller implant in order to create a proportional breast. For instance, the BW 11 breast that was overagumented to 400 mL and is now being properly sized down to a volume of 250 mL may need the NIMF reduced to 7.5 cm, from what might be as much as 9 cm. Failure to do so will result in excessive lower pole fill and perhaps an upturned nipple–areola complex.

There are many patients in this category who are good candidates for implant removal without replacement. Sometimes a patient had a proportionally sized implant and has gained weight over time Sometimes tissue pinch of >5 cm is easily palpable around the entire periphery of the implant, and such a patient may want to be substantially smaller. Frequently, in order to make the patient's breasts the size they want, the device size becomes so small that it makes sense just to be explanted. If an implant is very small relative to the overall size of the breast, then it will do little to augment it. What's more, the dimensions of such an implant would render it to sit down in the lower pole of the breast, contributing to a perception of ptosis and adding nothing to upper pole fill.

Severe rippling

If a hypothetical patient had adequate soft tissue coverage over a small bag of pebbles, the 'implant' would still be non-visible and non-palpable. Put in more common terms, a large implant with thin coverage will frequently yield problems of some sort, while a small implant with substantial coverage will almost always be relatively undetectable. While the device gets blamed for rippling problems, the problem is far more often an inadequacy of soft tissue coverage. Patients and surgeons alike believe that a device will solve these problems. While it is true that some devices have this tendency less than others, no device can solve the problem of inadequate soft tissue coverage, and it is important that the surgeon sets this expectation with the patient.

The first priority in the patient with rippling is to assess the thickness of the parenchyma as described in the first section. Only after every effort to improve coverage has been made, and a plan to maximize tissue coverage has been discussed, should the patient and surgeon look to the implant as the possible solution to the problem.When saline implants (except the 468) were filled to manufacturer's recommended fill-volumes, they were invariably underfilled and rippled. Overfilling beyond that risked voiding warranties and made implants increasingly firm in feel and round in appearance. If filled further still, they developed stippling or scalloping around their periphery. While the added thickness of the textured shell should theoretically not contribute significantly to rippling, in clinical experience the presence of texturing seems to make rippling more pronounced. This was rarely seen with the McGhan Style, probably because this implant was properly filled (though it is consequentially firmer than the typically underfilled round saline implant, whether smooth or textured). Perhaps the texturing makes the shell a bit less pliable, making the fold a little stiffer with less of a tendency to dissipate with gentle pressure. Even silicone implants can ripple, as almost all silicone implants that have been made are still underfilled relative to mandrel volume. Like saline implants, this phenomenon seems more notable with textured implants.

The profile of a round implant may also make a device more or less prone to rippling. Many feel that higher profile implants tend to ripple less, but this has never been demonstrated. But it is logical that since a

higher profile implant has less shell surface area relative to volume, it would have less of a tendency to collapse and therefore fold. Or the phenomenon may be related to the fact that lower profile implants are often selected that are wider than the pocket will be, mandating that the wider implant fold on itself in order to fit within the pocket. It should also be pointed out that some degree of folding can always be expected on gentle palpation along the inframammary fold, particularly when tissue pinch is <1 cm. Inferolateral rippling palpable when the patient bends over should even be considered a normal phenomenon, as there is no pectoralis with which to cover the implant in this area and the tissue tends to stretch and thin in this area with time.

Solution

The solution for implant folding is first to optimize the soft tissue coverage. Second, the envelope needs to be considered, as an implant unconfined by a loose envelope will tend to fold on itself more than it would with the same degree of coverage in a tighter envelope. In such a situation, mastopexy should be considered. Finally, consideration should be made of the implant that will best be suited for the situation. In order, the implant that has the greatest tendency to fold to the least tendency to fold would be textured saline (other than 468), smooth saline, textured gel, smooth gel, and finally highly cohesive form stable gel would be the least likely to fold. Many patients and surgeons believe that the cohesive implant is the quick fix for these situations, and it is not. The shaped form stable devices are at particular risk for rotation in a revision. These risks can be reduced if a new pocket is made that will be tight around the implant, but this often cannot be achieved. And round form stable devices will indeed look quite round. This may be an acceptable trade-off in these situations, but this needs to be understood ahead of time.

Rupture

We tell all patients that no device is a lifetime device, presupposing that all are destined to ultimately fail. In fact, we do not know whether this is true, as changes to the soft tissues or patient desire for replacement with a new implant prior to actual failure of the previous implant makes truly long term studies impossible to ever complete. With saline implants, the rupture is usually obvious, with one breast decreasing in size in a matter of days or weeks. With silicone implants, rupture can be diagnosed because the patient develops swelling, distortion, or newly developing capsular contracture (though there are other causes of this). Or rupture can be presumptively diagnosed by radiological imaging studies.

Scoring

1 Significant device-related deformity.
2 Moderate device-related deformity.
3 No device-related deformity.

Results

Case 1

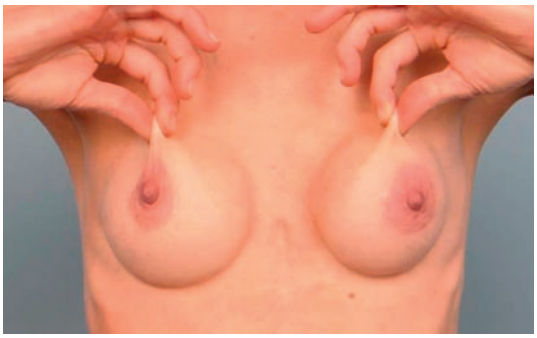

Figure 8.1 A patient demonstrates skin pinch of upper pole of breast to determine the soft tissue coverage. This patient demonstrates the inadequacy of her submammary coverage.

Case 2

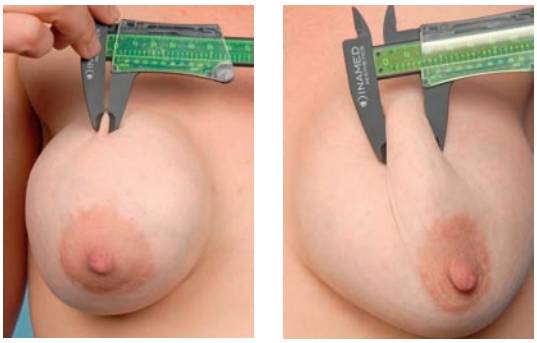

Figure 8.2 Asymmetry.

Case 3

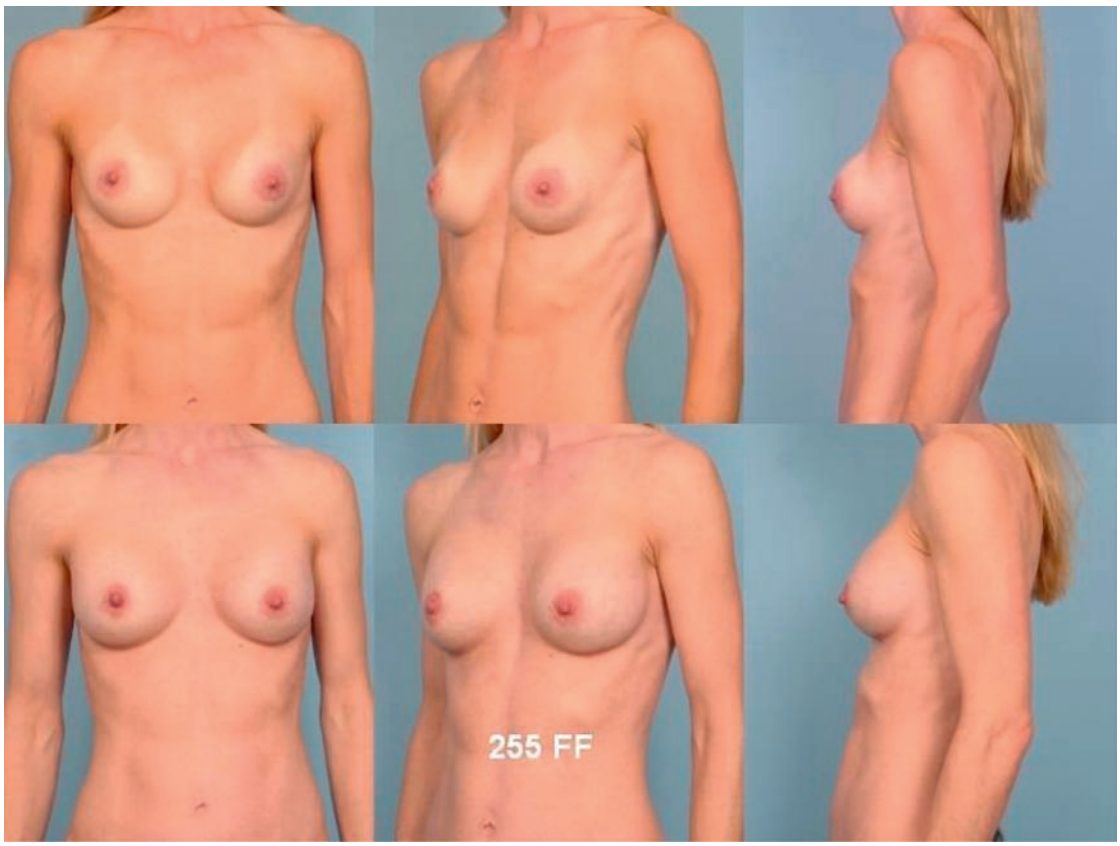

Figure 8.3 Patient demonstrating correction of capsular contracture with capsulectomy and creation of a new pocket for properly positioned implant to correct the convexity in the upper pole. The capsules look contracted, but her implants are soft. The implants are submammary and there is little coverage. The patient is shown post-operatively after a change to a dual plane pocket with a full height cohesive anatomic implant, which provides a predictable fill to the upper pole of the breast.

Case 4

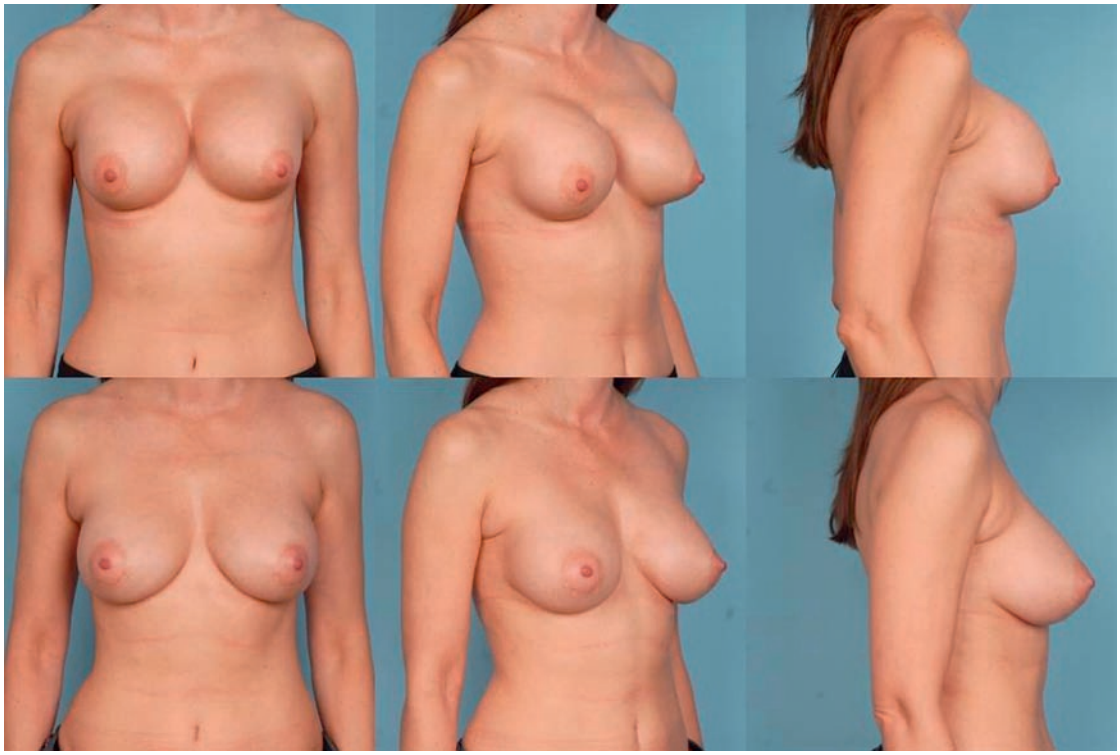

Figure 8.4 This case also looks like a capsular contracture, but the saline implants are soft but they are too big and malpositioned. Neosubpectoral pockets were created and smaller silicone gel implants were placed.

Case 5

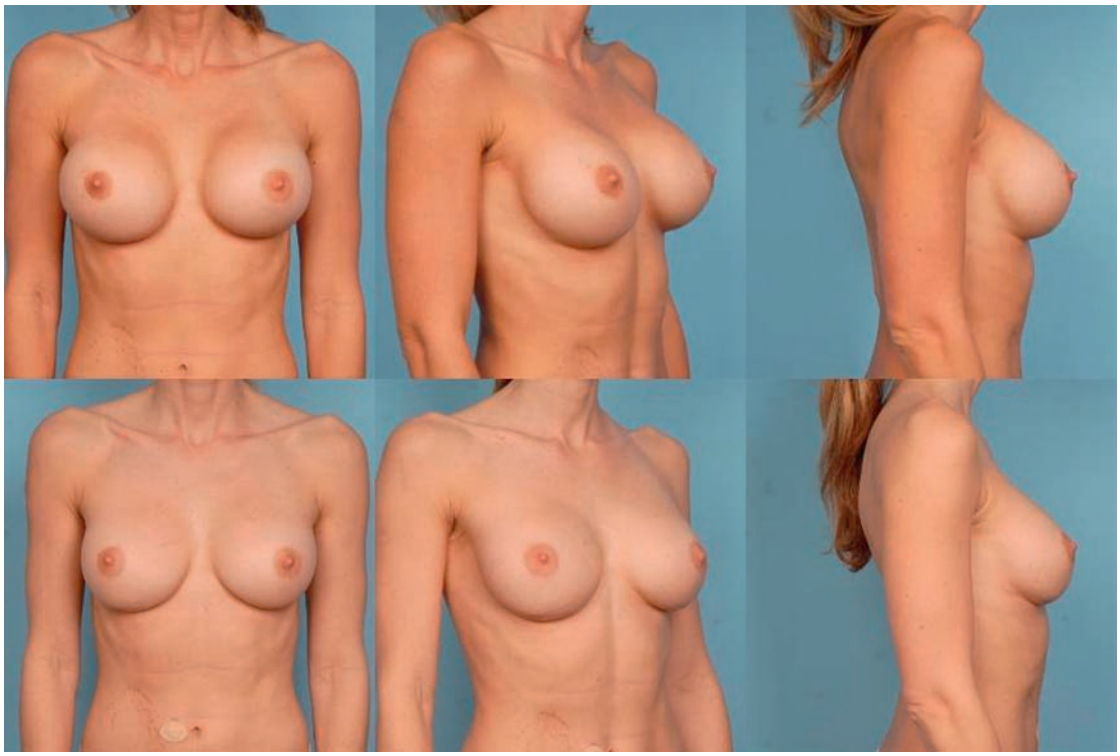

Figure 8.5 The capsules were thin, and the patient's overfilled large saline implants were replaced with smaller, silicone-gel-filled implants.

Case 6

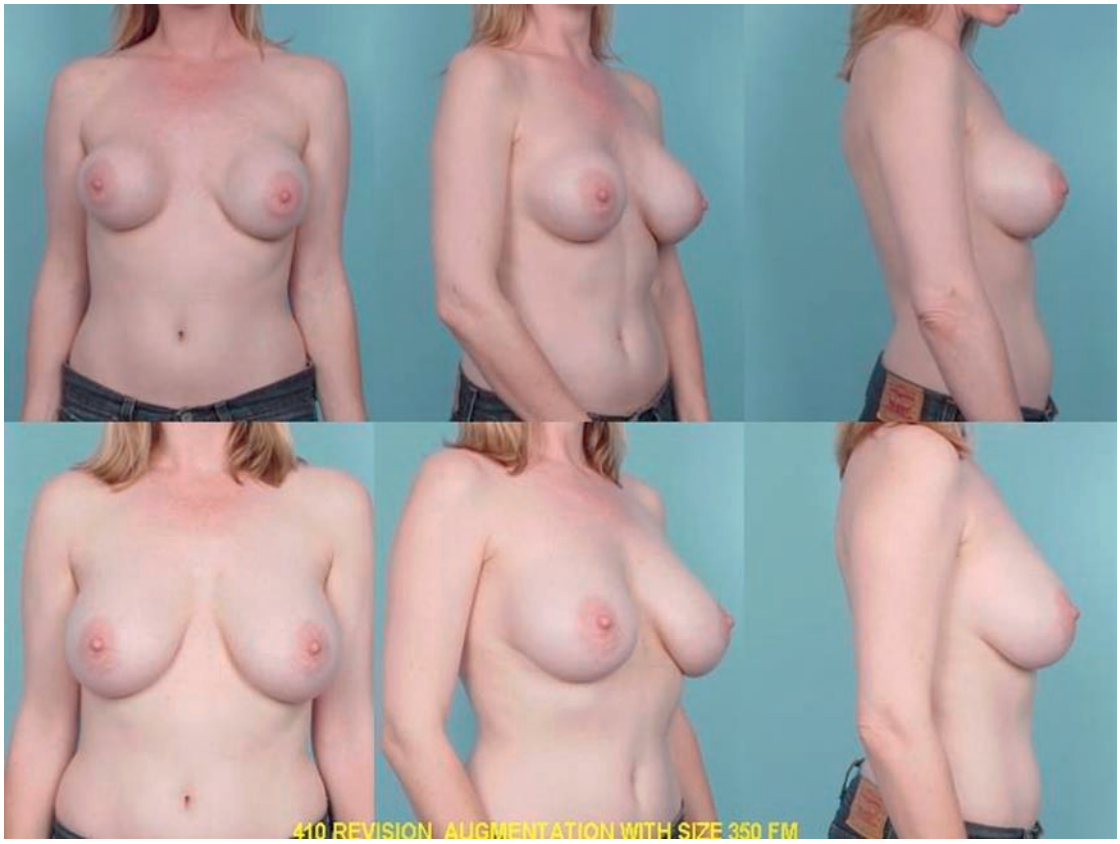

Figure 8.6 Demonstrates subglandular capsular contracture. The patient is shown after conversion to a retromuscular dual plane pocket using an anatomic high cohesive gel implant.

Case 7

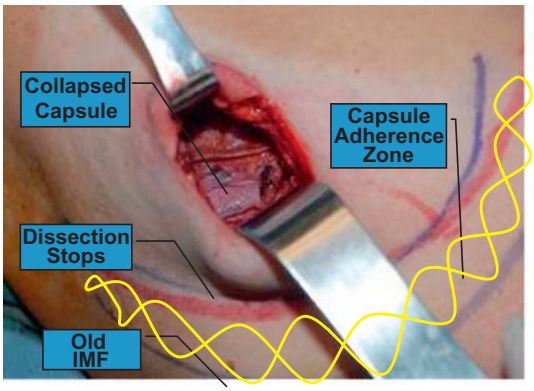

Figure 8.7 The capsule is shown with elevation of a low inframammary fold from implant migration and overdissection of the lower pole. The new zone of capsular adherence is shown. The neosubpectoral pocket is ideal in such a situation, as the repair does not rely upon sutures; it relies upon the intimate adherence of the capsule to overlying tissue.

Case 8

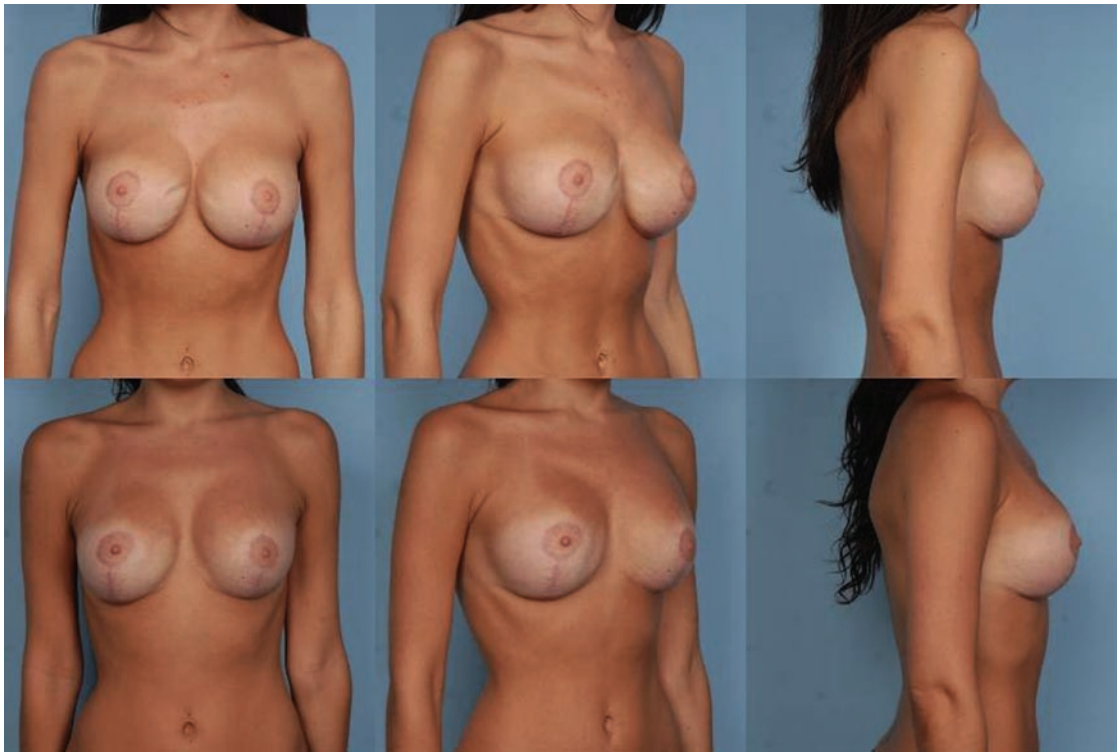

Figure 8.8 Correction of significant breast ptosis with rippling and asymmetry with correction of implant placement and mastopexy. The photograph shows the patient 8 months following placement of Alloderm acellular dermal matrix (courtesy of Dr Scott Spear). The rippling is virtually eliminated. The alloderm was sewn as a 'handle' to the caudal cut edge of the muscle and used to pull it down over the implant to maintain muscle coverage over a greater portion of the implant. In the more inferior area, where the muscle would not reach, the Alloderm added thickness to the coverage.

Case 9

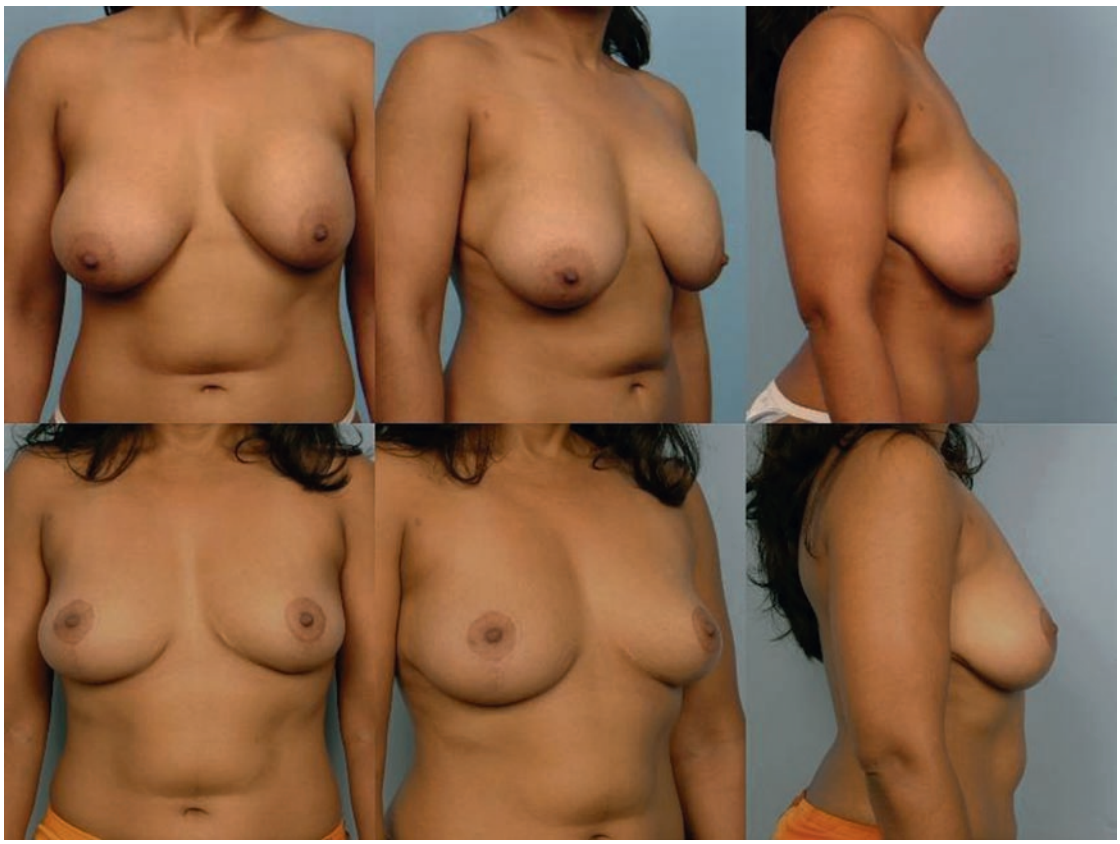

Figure 8.9 The implants were not replaced.

Case 10

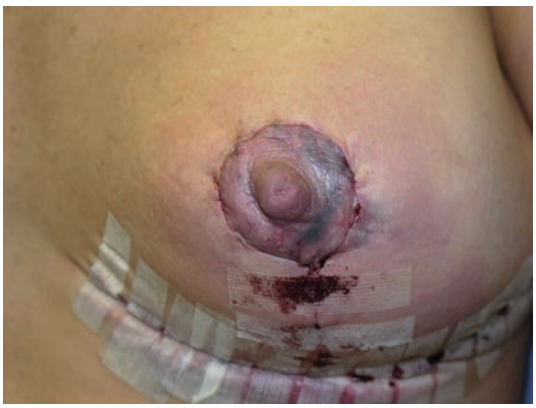

Figure 8.10 Care should be taken to preserve blood supply to the nipple during mastopexy in patients with thin soft tissue coverage following subglandular augmentation.

Case 11

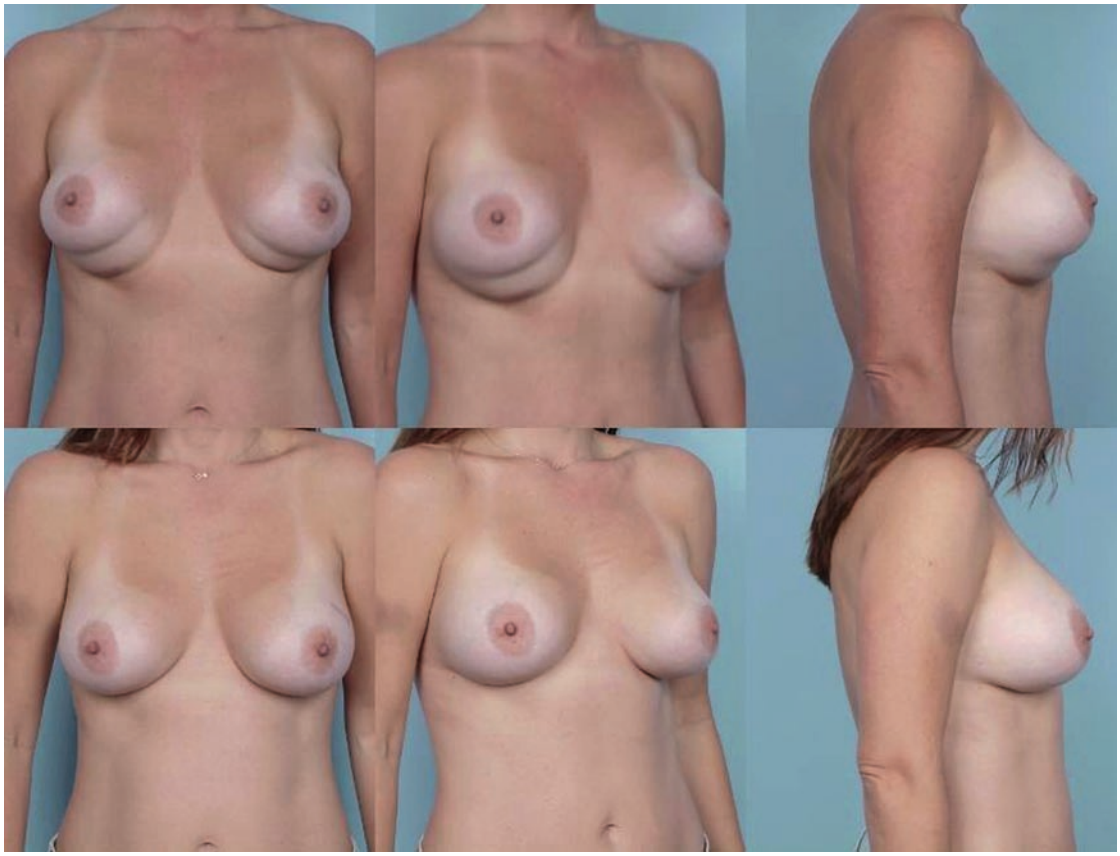

Figure 8.11 Patient with double bubble deformity shown after capsulorrhaphy; conversion to a new pocket is another common option for correction of this deformity.

Case 12

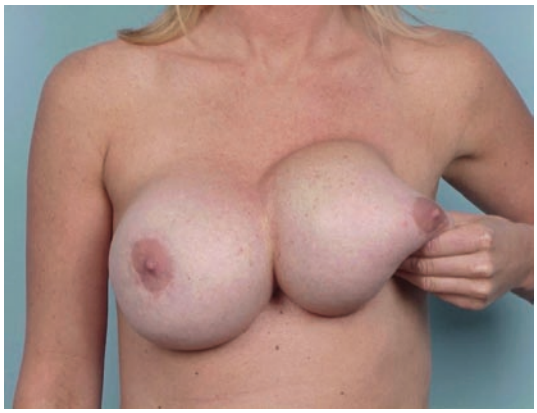

Figure 8.12 A patient with severe symmastia with 600 mL implants.

Case 13

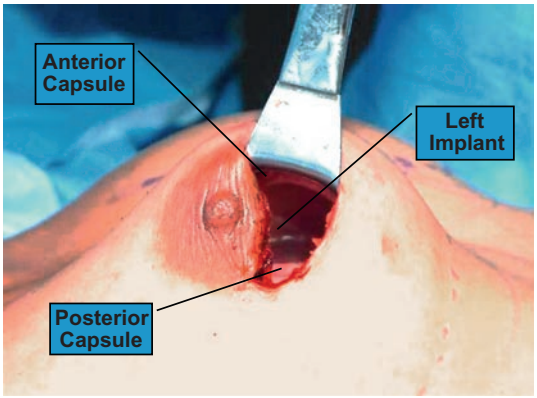

Figure 8.13 Demonstrates true symmastia: the implant pockets connect and the left implant is visualizable through the right incision. Capsulorraphy would have been difficult: though there is thick tissue anteriorly with which to sew, posteriorly there is just thin capsule over sternum and ribs.

Case 14

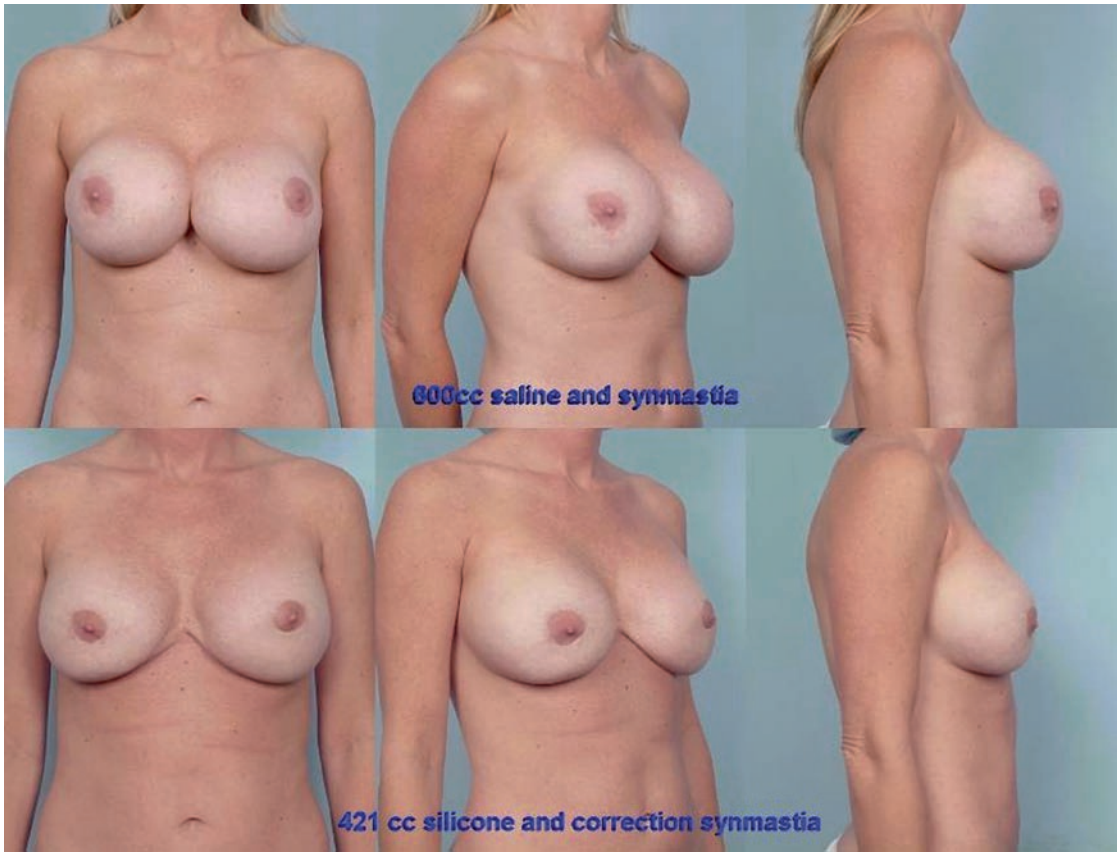

Figure 8.14 The patient is shown after correction using a new pocket while avoiding medial dissection.

Case 15

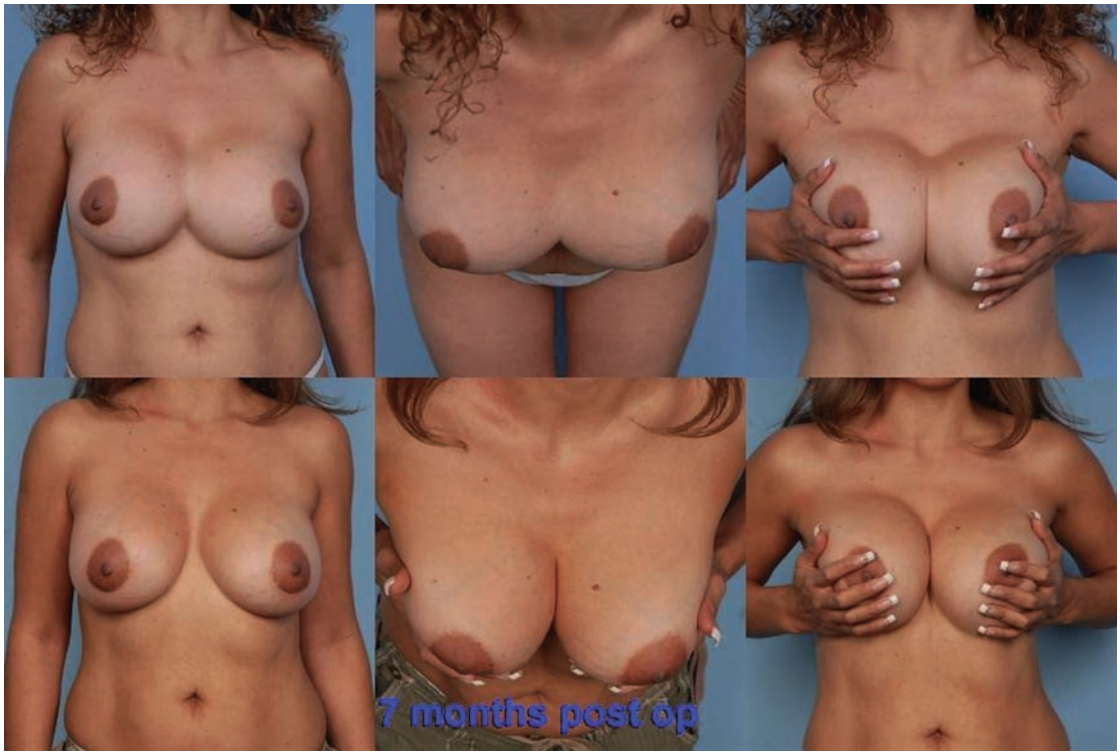

Figure 8.15 This was corrected with creation of a neosubpectoral pocket and exchange of saline implants for smaller silicone implants.

Case 16

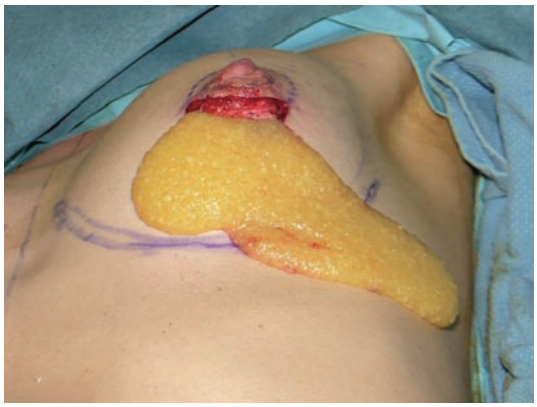

Figure 8.16 A ruptured silicone gel implant.

Further reading

Adams Jr WP. The process of breast augmentation: four sequential steps for optimizing outcomes for patients. Plast Reconstr Surg 2008;122:1892–1900.

Adams WP, Bengston, BP, Glicksman CA et al. Decision and management algorithms to address patient and Food and Drug Administration concerns regarding breast augmentation and implants. Plast Reconstr Surg 2004;114:1252–1257.

Adams Jr WP, Rios JL, Smith SJ. Enhancing patient outcomes in aesthetic and reconstructive breast surgery using triple antibiotic breast irrigation: six-year prospective clinical study. Plast Reconstr Surg 2006;118(Suppl 7):46S–52S.

Adams Jr WP, Teitlebaum S, Bengson BP et al. Breast augmentation roundtable. Plast Reconstr Surg 2006;118(Suppl 7):175S–187S.

Handel N. Secondary mastopexy in the augmented patient: a recipe for disaster. Plast Reconstr Surg 2006;118(Suppl 7):152S–163S.

Handel N, Jensen JA. Capsular contracture: results of 3002 patients with aesthetic breast augmentation: Reply. Plast Reconstr Surg 2006;118:1500–1502.

Handel N, Hayden BB, Jervis WH, Maxwell PG. Revisions in breast augmentation. Aesth Surg J 2000;20:141–148.

Maxwell GP, Gabriel A. The neopectoral pocket in revisionary breast surgery. Aesth Surg J 2008;28:463–467.

Spear SL. Reoperations or revisions. Plast Reconstr Surg 2007;119:1943–1944.

Spear SL, Bogue DP, Thomassen JM. synmastia after breast augmentation. Plast Reconstr Surg 2006;118(Suppl 7):168S–171S.

Spear SL, Carter ME, Ganz JC. The correction of capsular contracture by conversion to "dual-plane" positioning: technique and outcomes. Plast Reconstr Surg 2006;118(Suppl 7):103S–113S.

Tebbetts JB. Discussion: breast capsulorrhaphy revisited: a simple technique for complex problems. Plast Reconstr Surg 2005;115:302–303.

Tebbetts JB. Wishes and tissues: a concern about dimensional planning systems that lack volume restrictions and do not prioritize long-term soft-tissue coverage. Plast Reconstr Surg 2006;117:318–320.

Tebbetts JB. Achieving a zero percent reoperation rate at 3 years in a 50-consecutive-case augmentation mammaplasty premarket approval study. Plast Reconstr Surg 2006;118:1453–1457.

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 2006;118(Suppl 7):35S–45S.

Teitelbaum S. The inframammary approach to breast augmentation. Clin Plast Surg 2009;36:33–43.

Wiener TC. The role of betadine irrigation in breast augmentation. Plast Reconstr Surg 2007;119:12–15.