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CHAPTER **54**

The dual plane approach to breast augmentation

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History

The breast implant pocket choice has a profound effect on the appearance of the augmented breast. Along with the selection of the device itself, it is the most important preoperative decision. Critical manifestations of this choice may not be apparent for many years, as some effects of the implant on the soft tissue occur gradually yet inexorably.

The most commonly described pocket locations are: (1) total submuscular (subserratus and subpectoral); (2) partial retropectoral (behind the pectoralis with its origins from the ribs left intact); (3) subfascial (between the pectoralis muscle fascia and the pectoralis muscle); (4) submammary or subglandular (between the breast and the pectoralis fascia).

Total submuscular is more frequently a reconstructive technique, less commonly done for augmentation owing to a more painful and bloody dissection, a tendency for the device to rise superiorly, and difficulty in predictably creating a deep and well-formed inframammary fold. Subfascial has not been widely adopted due to an absence of satisfactorily controlled or long-term data. With scarcely 0.5–1 mm more coverage than a classic submammary dissection, this procedure is only a minor variation of the submammary pocket and does not qualify as a distinct pocket type.

Partial retropectoral and submammary are the most popular methods. Proponents of each are quick to point out the distinct advantages of their technique and the disadvantages of the other. These comments are frequently appropriate.

But these comments are not equally applicable to all situations. There are indeed breast types for which the benefits and drawbacks of one pocket makes it the better choice. Even so, some shortcomings of that preferred pocket frequently remain at issue.

The dual plane as first published by John Tebbetts in 2001 is the ideal compromise, in that it allows the implant to be simultaneously retropectoral where the device most needs coverage, and retromammary where it most needs to be in direct apposition to the breast. This allows near-total achievement of the purported benefits of both at the same time, while minimizing the trade-offs associated with selecting just one of the two pockets. It is therefore less of a compromise per se, than a way of "having your cake and eating it, too", essentially doing both pockets at once, using each pocket where it exacts its greatest benefit.

While submammary and partial retropectoral are "pure" extremes, the dual plane is a continuous spectrum of options, occupying the "gray-zone" in between. The operation starts with the creation of a partial retropectoral pocket. The origins are carefully divided along the inframammary fold, which allows the cut edge of the muscle to glide a bit superiorly, so that there is both a small submammary and a large subpectoral area of the pocket, and hence the term dual plane. By disrupting attachments of the muscle to the overlying gland, the muscle can be gradually and incrementally raised, thereby reducing the proportion of subpectoral pocket and increasing the proportion of submammary pocket. The purported advantages of the partial retropectoral pocket are predominantly coverage along the sternum and over the superior border of the implant; the dual plane preserves these. The purported advantages of the submammary pocket are to direct implant pressure upon the lower pole; the dual plane preserves these as well (**Fig. 54.1**).

Criteria for the ideal pocket

Our ability to determine the ideal pocket for a given situation rests upon the criteria that we choose to use to make that determination. Rather than vague, subjective decisions that allow certain issues to be overemphasized and others neglected, it is important to attempt to quantify all of the pertinent issues and measure each of the methods against them.

Over the last several decades, published reoperation rates in PMA studies have not changed despite the use of different implants, remaining consistently at about 20% at three years. In a study of one device, a single surgeon achieved a 0%

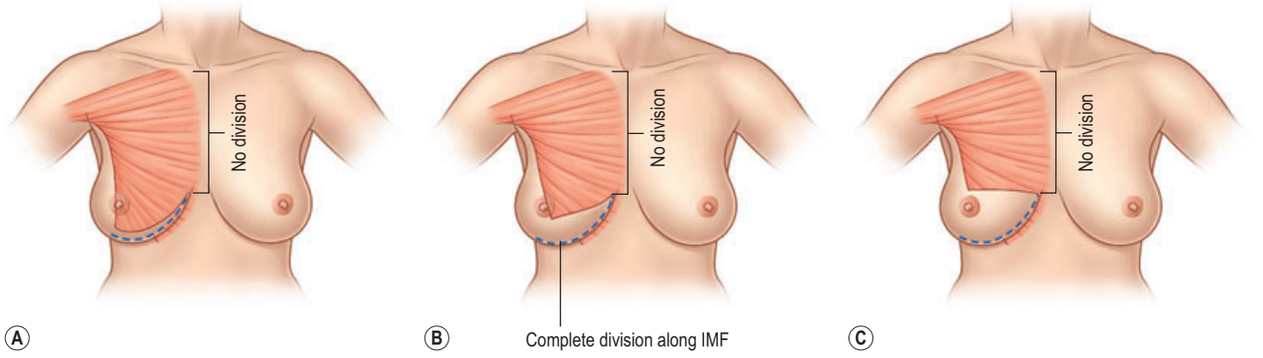

Fig. 54.1 The three types of dual plane breast augmentation. **A**, Dual Plane Type I. **B**, Dual Plane Type II. **C** Dual Plane type III.

Fig. 54.2 Retromuscular pockets are often criticized for causing high-riding implants. In this case, the dissection was a blunt/blind transaxillary augmentation. The muscle was divided along the IMF on the left, but not the right. This is not a shortcoming of the procedure itself, but from its execution in this particular instance.

3-year reoperation rate in contrast to an average of 13.9% for all the doctors in the study. Taken together, these two findings demonstrate that the outcome in breast augmentation is determined far less by the type of the device than by other factors (**Fig. 54.2**).

In the absence of data, surgeons must turn to the anecdotal. But when data is available, it trumps anecdote. Of all endpoints, the most decisive measurement of outcome is the reoperation rate, as it is an incontrovertible endpoint. "Satisfied" or "happy" patients are imprecise and unquantifiable endpoints, and since we have all seen unhappy patients with beautiful results and thrilled patients despite notable problems, they do not qualify as adequate endpoints with which to entirely judge the quality of an operation.

The absolute incidence of reoperation tells only part of the story: the severity of a problem must also be considered. Some may be minor or annoying, while others may be deforming and even uncorrectable. It is therefore not enough just to tally complications, but also to consider their severity.

Dual plane data objectively show that this procedure succeeds in maintaining the advantages of both pockets while mitigating the trade-offs associated with selecting a single pocket.

Preservation of future options in the event of an unsatisfactory outcome is important: if Plan A was still a viable option after Plan B, but Plan B would not be after Plan A, then that would suggest an advantage for starting with Plan B.

Finally, outcomes need to be assessed at long intervals after surgery. Irrevocable, permanent, progressive, and at times totally uncorrectable changes occur to a breast years after an augmentation. Adequacy of tissue coverage needs to be judged at the longest possible intervals, decades if possible. Such long-term data is meager, but owing to the importance of such lifelong changes on the breast, at this point anecdote and extrapolation of shorter-term results should be considered (**Fig. 54.3**; Table 54.1).

Pain and recovery

In general, there is less pain with the submammary approach, as the submuscular approach subjects the sensitive rib cage to possible trauma and the overlying muscle to stretching. But the largest data ever assembled on postoperative pain showed that 24-hour recovery without the use of any narcotics or pain pumps could be routinely achieved with a dual plane approach. Bloodless surgery and avoidance of creating any rib trauma circumvented the typical pain experienced from the rib cage in submuscular patients. Precise, gentle elevation, bloodless elevation of a pectoralis muscle paralyzed by the anesthesiologist results in a minimum of trauma to the muscle.

This author has routinely been using these techniques for many years, and only uses ibuprofen for postoperative pain for routine augmentation mammaplasty in all planes, including the dual plane. Dual plane patients routinely go out to dinner, shower, and wash and brush their own hair the night of surgery. They describe the feeling as "tight", a "pressure", "soreness", or "like working out hard".

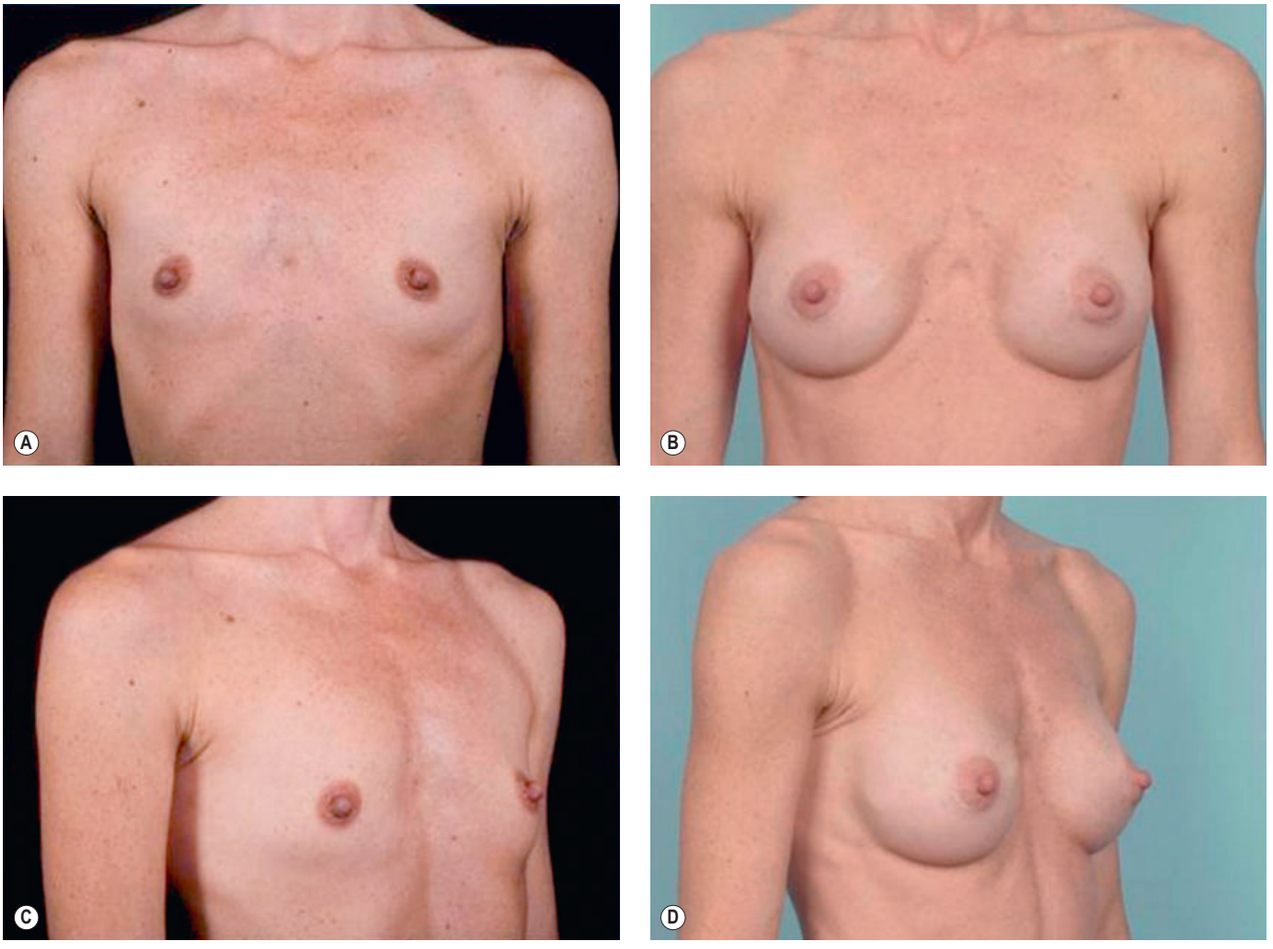

Fig. 54.3 **A&C**, Preoperative. **B&D**, Postoperative. Anecdotes are anecdotal, but sometimes that is the best that we have. If anyone doubts the importance of muscle coverage, they should be shown a series of patients with tissue so thin, with a saline implant looking like this, 11 years after surgery, free from capsular contracture, visible edges or rippling. Cases like this abound, but there are few examples of submammary or subfascial patients at this interval that look this good.

When these same techniques are applied to the submammary approach, patients typically feel slightly less stiff and sore than do dual plane patients, but both groups still consistently achieve a "24-hour" recovery. Any difference is subtle, noted only for a day or two, and is of no real consequence, particularly relative to advantages of achieving more muscle coverage.

Coverage and stretch

Soft tissue coverage is the single-most important issue affecting the short and long-term result after a breast augmentation. With adequate coverage, the implant edges are less visible, and the breast looks more natural and less augmented. Any folds or irregularities with the implant shell are more concealed. With more tissue over it, the device is less palpable. With less tissue coverage, the edges of the implant are more visible, the breast looks more augmented, and it is easier to feel the implant (**Fig. 54.4**).

Over the long term, these changes become more profound. Implants put pressure on the breast, and the parenchyma gradually compresses and atrophies. The presence of the implant stretches and thins skin. This occurs with implants in all positions. No study will ever randomize patients of similar tissue types and implant sizes and follow them over enough time for a scientific conclusion to be made. But a large amount of clinical observation and logic (see **Fig. 54.3** and **Fig. 54.5**) offers us guidance.

Examples of submammary patients with severe parenchymal atrophy abound, while retropectoral patients with similar characteristics are rarely seen. And when they are, though the implants may have ostensibly been placed "behind the muscle", secondary surgery frequently reveals that the muscle has been avulsed off both the inframammary fold and sternum, thereby sacrificing the critical coverage of which we are speaking (**Fig. 54.6**).

These problems are sometimes noticeable within a year or two, but can often take years more to develop. We must be

Table 54.1 Pocket comparisons

Issue	Advantage PRP	Advantage subglandular	Dual plane remedies
Less pain		X	Best data to date
Better coverage	X		Large advantage vs. SM; difference relative to PRP dependent upon release and up to determination of surgeon
Access to lower pole parenchyma		X	Yes
Expands constricted breasts		X	Yes
Fills ptotic breasts		X	Yes
Avoids muscle animation		X	Rarely clinically significant
Reduces tendency to "ride high"		X	Yes
Reduces tendency to "lateralize"		X	Yes
Faster recovery		X	Best data to date
Less capsular contracture	X		Best data to date
Better for mammograms	X		Appears to be
Reduce parenchymal atrophy	X		Best data to date
Reduces stretch deformities			Best data to date
Narrower cleavage		X	No – but subglandular can only do so at the expense of coverage

Fig. 54.4 Tissue coverage is always a priority, particularly superiorly and medially. The implant she holds in her hand mimics what is occurring within her breast. With muscle coverage in the upper pole, such a deformity will rarely if ever occur.

Fig. 54.5 This is not a capsular contracture. This is a submammary implant. The breast is soft. The patient chose this at the surgeon's behest in order to avoid animation deformity. But even in repose, the significant deformity is present; there is no substitute for soft tissue coverage.

aware of these problems and remind ourselves that we need to create a result that will look good not just for years, but for decades. As someone who sees many secondary problems, I can state categorically that subglandular patients present more frequently, with more severe problems, and with more unsolvable problems than do subpectoral or dual plane patients.

Such tissue thinning with submammary patients also is a set up for a problem which is difficult to correct, as to do so often requires a switch to the partial retropectoral or dual plane position. But once there is a subglandular pocket, the coverage in the retropectoral pocket is forever impaired. Though one can use sutures to tack the muscle back up to the gland, its caudal cut edge can never be retained as caudally as it might have been were this not to have happened, thereby forever impairing inferior coverage. Marionette pullout sutures have been described to hold down the muscle in this situation, but this also cannot achieve the same degree of

coverage as if the attachments between the muscle and the overlying gland were never disrupted (**Fig. 54.7**).

In conjunction with the thinning, there is often progressive stretch of the skin envelope, sometimes necessitating mastopexy. Even if this mastopexy would have been inevitable in the future with a partial retropectoral or dual plane pocket, such patients frequently have soft tissue thinning or capsular contractures in addition to the stretched skin. This necessitates a pocket change and possible capsulectomy in addition to the mastopexy, which can be a riskier procedure than if the implant had started out dual plane or partial retropectoral. This combination of secondary revision occurs so frequently that efforts must be made at the time of the original surgery so that this doesn't happen (**Fig. 54.8**; also see **Fig. 54.5**).

If tissue coverage is adequate, it almost doesn't matter what is going on with the implant; a capsular contracture may be less noticeable; suboptimal implant shape may be less problematic; implant folds might be harder to discern. These are powerful reasons to select the partial retropectoral pocket over the submammary pocket.

But what should one do if there is glandular ptosis or a constricted lower pole and the tissue is thin? Partial retropectoral is preferred for the tissue coverage issue, but submammary may be necessary to allow better expansion of the lower pole. The dual plane solves this dilemma by allowing the upper and inner portion of the implant to be covered by muscle, while the inferior portion, the part that needs to push directly on the gland to expand and fill it, can be allowed to be in direct apposition.

Achieving "adequate" coverage is an insufficient goal. "Maximum" coverage must be the goal. There is almost no long-term problem that is not solvable when substantial soft tissue is available, and there are few problems completely correctable when soft tissue is not available.

There is some sacrifice in coverage with the dual plane relative to partial retropectoral, and if tissue coverage in the lower pole is such that the benefits of changing to the dual plane do not outweigh its advantages, then it is suggested to patients to have a partial retropectoral pocket. In any case, the reduction in coverage with the dual

Fig. 54.6 This patient just had removal of subpectoral implants. The dotted line indicates the caudal border of the pectoralis. Though she had "retromuscular" pockets, the implant itself had negligible if any coverage as the muscle was so high it could cover only a bit of the implant, and the pressure of it probably pushed the implant away. Though her muscle was still attached to the sternum, the muscle had been inadvertently detached from the overlying parenchyma, thereby allowing it to window shade up far higher than would be ideal even for a DP III.

Fig. 54.7 This patient had a submammary capsulectomy and then had a submuscular pocket dissected. It illustrates the basic principle of the DP approach. With no attachment of the muscle to the overlying parenchyma, this muscle window shades strongly superiorly. The DP approach recognizes the importance of maintaining those attachments when it is important to keep the muscle inferiorly to maintain coverage, and emphasizes the importance of a gradual and incremental release of them to allow controlled vertical elevation of the muscle and exposure of the parenchyma in the lower breast when the situation demands.

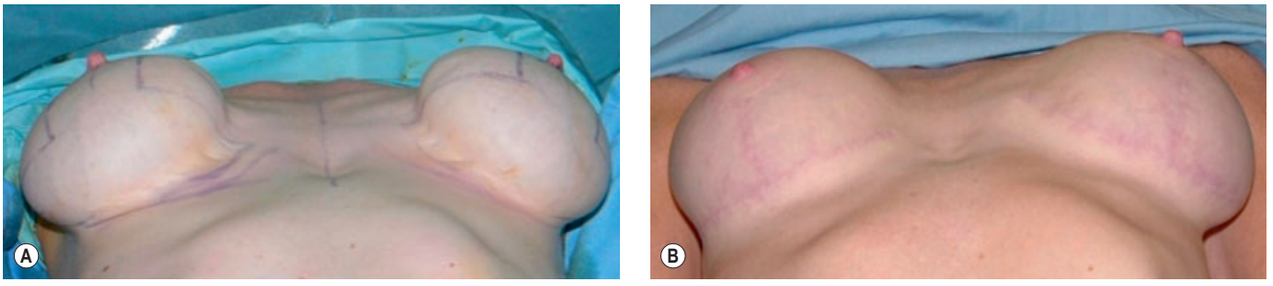

Fig. 54.8 The most common argument for submammary placement is to deal with the postpartum involution and ptosis patient who does not want mastopexy scars. But this group has the thinnest tissue and is the most prone to stretch and thinning. **A**, A patient merely two years following such a procedure; note the extreme parenchymal atrophy and skin thinning. **B**, Note the improvement still noted two years after conversion to a dual plane.

plane relative to partial retropectoral is reasoned and controlled.

Access to parenchyma

The most profound advantage of submammary over partial retropectoral is attributable to the direct pressure the implant can make against the gland. This can make it look less empty, and the pressure can better expand a tight lower pole. If behind the muscle, the muscle essentially protects the pre-existing configuration of the lower pole, inhibiting the implant's ability to push it and fill it out. And if weak fibrous connections between the pectoralis muscle and breast gland allow the gland to slipe relative to the muscle, placing the implant against the breast tissue can help reduce the extent of inferior tissue migration. Otherwise, the subpectoral placement still allows the gland to slide inferiorly relative to the muscle (**Figs 54.9** and **54.10**).

Depending upon the degree of release with the dual plane, these advantages of the submammary approach can be almost completely if not completely realized with the dual plane approach. The coverage that is preserved superiorly and medially typically allows for muscle coverage where it is most needed: superiorly and along the medial sternal border.

Capsular contracture

Capsular contracture still remains the leading cause of reoperation in PMA studies, yet publications using antibiotic irrigation and the dual plane pocket have resulted in some of the lowest reported capsular contracture rates to date. Whether it is specifically due to the dual plane per se or other factors, such as the irrigation, is not entirely clear. But it is sufficient to say that the lowest reported capsular contracture rates are with the dual plane position, and no paper suggests an advantage to partial retropectoral over dual plane. Dual plane is the ideal choice.

Mammography

Given the cancer prone nature of the breast, optimizing the ability to detect cancer early must remain a priority. Numer-

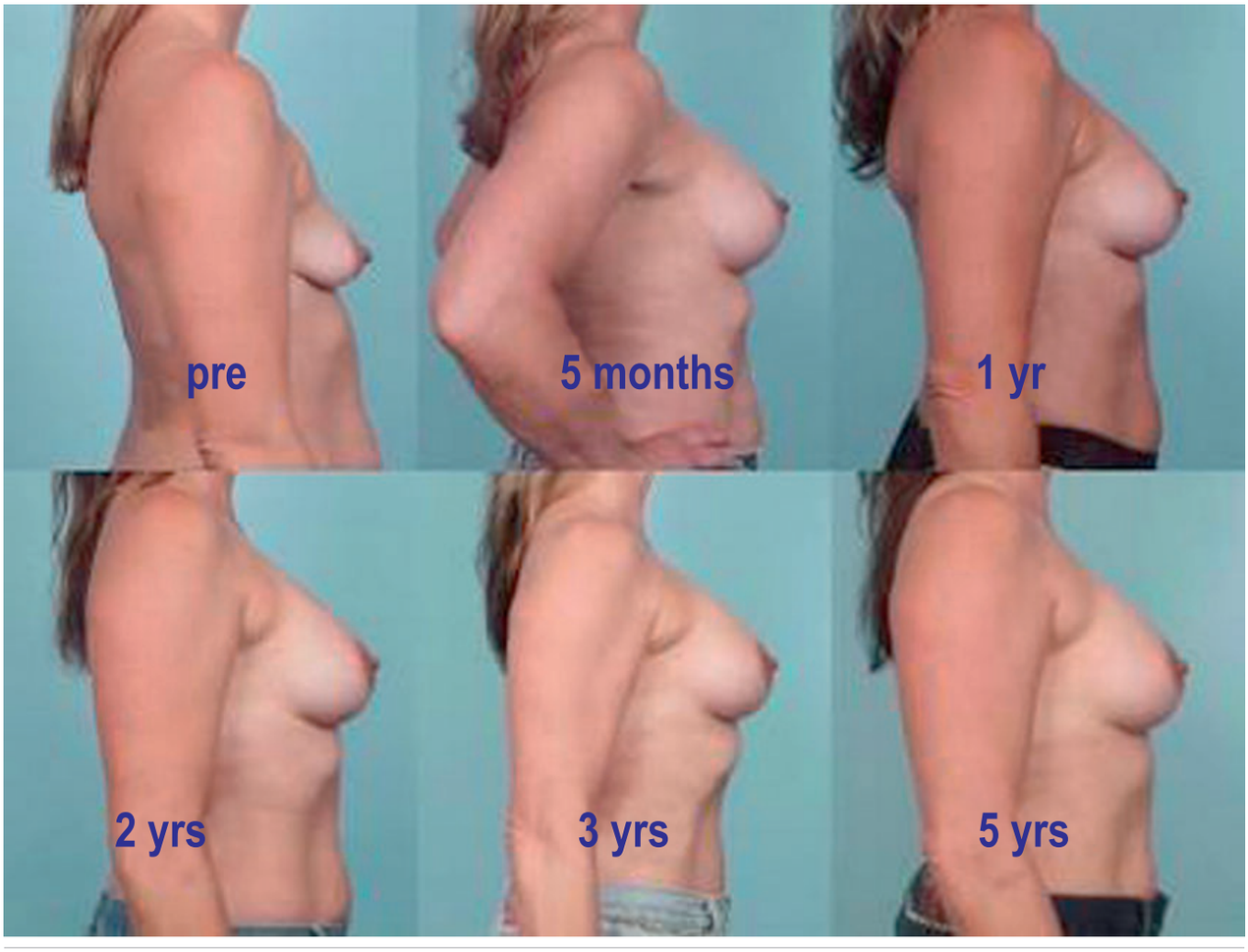

Fig. 54.9 The long term stability of the outcome in this post partum atrophy/ptosis patient with implants in the dual plane position demonstrates the value of proper implant sizing and tissue coverage.

Fig. 54.10 The constricted lower pole breast is frequently touted as being a reason for submammary, as it allows scoring of the lower pole. In this case, shown here at 5 years post-surgery, a DP II was done, allowing the muscle to rise to the lower border of the areola. This exposed parenchyma for the entire lower pole of the breast, allowing it to be shaped just as much as it would have been were this to have been a submammary placement, but with maintenance of muscle coverage superiorly and medially, which helps to obscure the borders of the implant.

ous authors have suggested an advantage to retropectoral over submammary placement for this regard, but it is unclear whether the advantage is directly due to the anatomic location relative the muscle itself, or due to a lower capsular contracture rate below the muscle. Suffice to say, mammogram is impaired when the breast tissue cannot be pulled out and away from the implant and placed between the mammogram plates, such as when the implant is hard, there is a large implant relative to the breast tissue, or any other reason that restricts the pull of the tissue forward. While no studies have specifically compared sensitivity of mammogram between these pockets over a long period of time, the low incidence of capsular contractures and the extensive muscular coverage over a dual plane implant suggests that this would not be a problem. In any case, the role of MRI in screening for breast cancer is increasing, even for women without breast implants. And since implants do not affect its sensitivity, this entire issue may soon be moot.

Muscle animation

The lack of significant implant motion or distortion with contraction of the pectoralis is a significant advantage of the submammary position relative to the partial retropectoral pocket. But it is not enough to look at the problematic subpectoral patients with animation problems: one must also be aware of the submammary patients with significant implant visibility even in repose. The deformity of a thin patient with subglandular implants at rest is typically more profound than a partial retropectoral patient during maximal contracture.

With the dual plane approach, the release of the pectoralis along the inframammary fold (IMF) reduces if not totally eliminates the forces that might distract the implant superiorly. While the medial origins along the sternum may compress and slightly lateralize the implant on strong contraction, they rarely cause a significant deformity (**Fig. 54.11**).

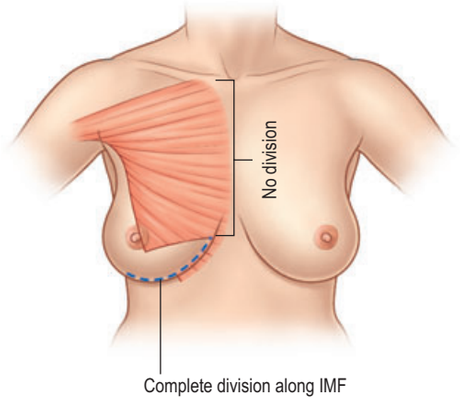

Fig. 54.11 A critical step of all dual planes – I, II, and III – is to completely divide the pectoralis major along the inframmary fold, stopping at the sternum, without division along the sternum. Failure to divide the origins along the IMF result in either a high-riding implant, superior malposition with animation, or a blunted IMF. However, if tissue coverage is thin (<5 mm), they probably should not be divided, as maintaining coverage is the first priority. Division along the sternum can result in symmastia, excessive edge visibility and uncorrectable deformities.

Certainly, there is some motion, but in the Tebbetts series, there was no revision requested for this reason. In my experience, there has been occasional complaint and discussion of revision, but I have not switched my own patient to a submammary pocket for this reason (**Fig. 54.12**).

Usually, the patients with any such problems are very thin, and were therefore the least well suited for a submammary pocket. The key in minimizing animation with the dual plane pocket is to uniformly and accurately take the muscle down along the inframammary fold, stopping evenly on both sides at the point at which the IMF meets the sternum, and never releasing along the sternum. It appears that when the IMF is horizontal and meets the sternum at a discrete point, these issues are less problematic than when the IMF curves sharply superiorly as it moves towards the sternum, oftentimes not actually meeting the sternum until being at or even above the level of the nipple. These patients are also often thin, and they represent a particular challenge, in that there in fact may be no way to avoid some deformity with either approach.

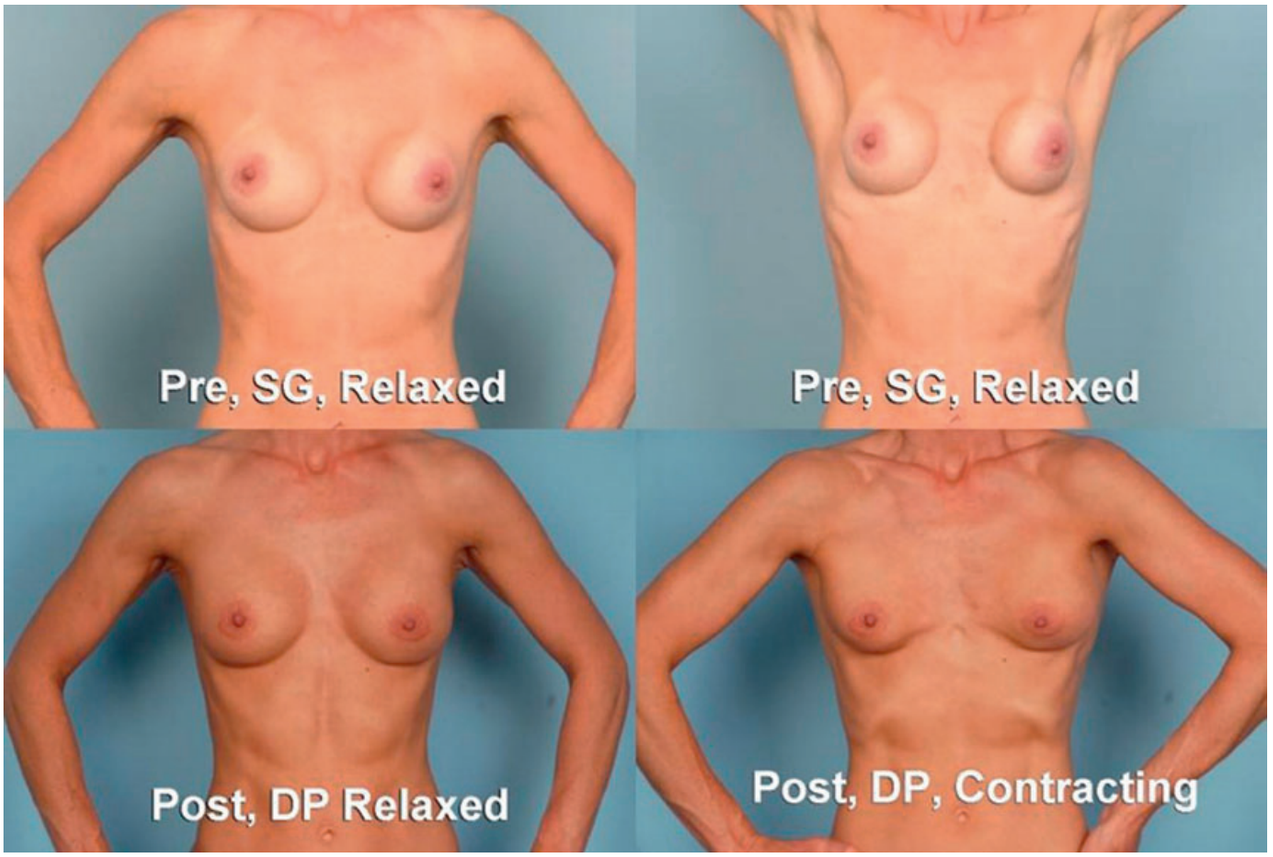

Fig. 54.12 DP and all retromuscular pockets are criticized for animation deformities. But the patient needs to be considered in repose as well. Here the same patient on the top is seen submammary, relaxed in two different poses. Though there is no animation deformity, the implants are unattractive. In the lower left, she is shown relaxed in the DP position, looking much prettier and more natural. In the lower right, she does demonstrate distortion with contracture, but no doubt even if this is the maximal distortion she can manage, it is still less deformed than she looks in either of the preoperative views in repose.

No matter which pocket is selected, the patient must be fully informed preoperatively of the trade-offs, and participate in the pocket selection. That way, if she has an animation deformity or implant deformity later, she can be reminded that she preferred accepting that problem to the risks of the other pocket. If a patient is not made aware of these choices preoperatively, then dissatisfaction and request for revision remain avoidable risks for revision.

Narrower cleavage

Both partial retropectoral and dual plane procedures accept the inner border of the pectoralis major muscle as an absolute limit to the medial placement of the implants. Once submammary, the implant can certainly be more medial. However, this comes at a price: the patients who most request or "need" such medialization invariably have the least soft tissue cover, and moving the implant medial to where the internal border of the pectoralis origin on the sternum results in risking symmastia and excessively visible implant edges. It is foolhardy to attempt to create cleavage by excessive medial placement of any implant, as tight skin usually pushes the implant laterally and the thin skin results in distinctly visible edges. So while the submammary does have the potential to place implants more medially, this amounts to more of a liability than an advantage.

Physical evaluation

Until experienced, most surgeons believe that an operation is all about what happens the day of surgery. In fact, it is the decisions that lead up to surgery that often have the most long-term effects on a result. This is particularly true of breast augmentation, where patient wishes, patient anatomy, and surgeon judgment converge. This topic is more important than pocket choice or any other issue with breast augmentation alone. The following are the most important of these points:

Patient education

The patient must be informed about the limitations of her tissue, so that her expectations are met. She must anticipate all trade-offs with respect to issues such as tissue coverage, animation, correction of ptosis, etc. When patients participate in these choices and sign off on them, the incidence of revision surgery is reduced and patient satisfaction increases.

Determination of ideal implant size

A patient is asked to decide whether she wants an implant that fits properly within her tissue, or she wants to force a certain size into her breasts without regard for creating an unnatural result in the short term and causing permanent tissue changes in the long term. Informed patients will usually select the latter. In that case, using the base width, skin stretch, and degree of envelope fill, the ideal implant size for that patient's breast is determined. Larger will have an upper convexity and look more full, stuffed, or fake. Smaller will have a concave upper pole and look emptier.

Determination of need for coverage and for muscle release

The dual plane preserves coverage and allowing coverage where it is needed. These two opposing characteristics need to be evaluated in all patients.

Coverage

It is always a goal to maintain as much coverage as possible, sacrificing coverage only when there is a reason to do so. With the exception of patient request (after being fully informed), a dual-plane approach is suggested to all. If coverage is <2 cm of pinch at the upper pole, then a submammary approach will not even be offered. If pinch <5 mm at the IMF, serious consideration is given to not releasing the muscle to create the dual plane, choosing instead to use a partial retropectoral pocket. In such situations, the long-term benefits of preserving maximal coverage often outweigh animation deformities, widening of the intermammary distance, and the predictability and crispness of the inframammary fold position.

Muscle release

The breast is examined for lower pole constriction or glandular ptosis that might necessitate controlled release of the muscle from the gland. While one might decide specifically preoperatively to perform a dual plane type II or type III, the surgeon should always start by dissection a type I, and then examine and feel the breast, releasing as much as is necessary during the operation.

Need for mastopexy

Many patients see plastic surgeons for a breast augmentation following lactation or weight loss. For some of these women, mastopexy is the appropriate procedure. Not wanting scars, some of these patients either receive an implant that fills, but is larger than they wish, or an implant of the size they want but which creates inadequate fill. In either case, and in particular in the case of the larger implants, the result is aesthetically compromised, and the already stretched skin stretches more and deteriorates with time. I have seen many such patients who had received submammary augmentations, and have tried this on my own patients. If followed long enough, the results are frequently unsatisfactory. Neither is the dual plan an answer for these patients; if the nipple (N) is below the fold, if N:IMF distance is >9.5 cm on maximum stretch, or if substantial parenchyma lays caudal to the inframammary fold, mastopexy must be considered, and augmentation should either not be attempted or only performed on the patient who clearly demonstrates an understanding of the limitations of such a procedure (see **Fig. 54.8**).

Anatomy

The pectoralis major muscle has origins along the clavicle, sternum, and the 4th–6th ribs along the IMF, and inserts onto the humerus, causing flexion and internal rotation. Studies

have demonstrated that the pectoralis origins along the IMF can be released without loss of strength or coordination.

What is most relevant to the dual plane is the recognition that the deep surface of the pectoralis glides over the chest wall. It is anchored like a trampoline on three sides to the humerus, clavicle, and ribs. Like a trampoline released on one edge, the muscle will retract strongly away from the side of the release.

The only thing that holds it in place – in distinct contrast to its deep surface – is that its superficial surface is tightly bound to the deep surface of the gland. The superficial surface of the muscle gives rise to the Cooper's ligaments and fibrous tissue that ramify throughout the breast. These attachments help hold the caudal edge of the muscle inferiorly, thereby maintaining coverage to the lower pole of the implant.

Following careful release of the muscle along the inframammary fold, the surgeon will observe the muscle "window shade", sliding superiorly 1–2 cm. However, if there was an inadvertent dissection on the superficial surface of the muscle, thereby disrupting some of the fibers connecting the muscle to the overlying gland, the muscle will window shade far more, sacrificing what might be intended coverage of the lower pole.

This point is most emphasized when creating a retropectoral pocket following a submammary capsulectomy. Even if the pectoralis origins along the IMF are left intact, the caudal edge of the muscle window shades very high superiorly; if those origins are released, it may move so high that it cannot even cover the implant at all. Understanding this dynamic is critical to the dual plane approach.

Technical steps

See Table 54.2; see also **Fig. 54.1**.

Though a dual plane dissection can be done from all incisions, the inframammary incision allows the greatest degree of visualization and control of the dual plane pocket. Most specifically, it allows preservation of all the attachments between the muscle and the overlying gland, so that if they need to be dissected, it can be done in a specific and controlled manner. Dissection from the periareolar incision down to the inframammary fold or the proposed level of transection of the muscle invariably results in some degree of inadvertent disconnection of the muscle from the overlying gland, thereby resulting in unintentional superior elevation of the muscle, creating for example a dual plane type II or III when a type I was the goal. I frequently perform revision surgery on patients who had periareolar augmentation in which the operative note described the procedure as "partial retropectoral" and described only division of the muscle along the inframammary fold, yet the caudal edge of the muscle is frequently found well above the upper border of the areola, beyond what is even considered a dual plane III. This may be due to a combination of a bit of release of the muscle along the sternum, but it seems more commonly due to a release of the attachments of the superficial surface of the muscle from the gland simply as part of the tunneling process to reach the inframammary fold. Unless a DP II or III is a goal, a surgeon should probably perform dual plane pocket surgery from the inframammary incision until they have gained substantial experience.

Many surgeons divide the muscle along the inframammary fold and describe the procedure as "half over – half under", or even "partial retropectoral", which is exactly what is described as a dual plane type I. Whatever the label, these surgeons should always be cognizant that the loss of tissue coverage from a periareolar incision is always a risk unless extremely fastidious dissection is done.

Table 54.2 Technical steps

	Description	Indication	Goal
Partial retropectoral	Pectoralis attached to sternum and to IMF	IMF pinch <5 mm	Maintain maximum coverage
Dual plane type I	Same plus complete division of pectoralis along IMF	All parenchyma above IMF; gland adherent to muscle; A:IMF on maximum stretch 4–6 cm	Small sacrifice in coverage to increase IMF accuracy; reduce animation deformity; allow implant to sit at bottom of pocket
Dual plane type II	Same plus pectoralis released from overlying gland and allowed to slide to about the lower border of the areola	Most parenchyma above IMF; looser attachments of gland to muscle with some sliding of gland over muscle; stretched lower pole skin with A:IMF under maximum stretch 5.5–6.5 cm	More sacrifice in lower pole muscle coverage in order to reduce risk of mobile parenchyma from sliding off of muscle, better fill of loose envelope
Dual plane type III	Same plus greater release of pectoralis from gland, allowing it to slide to about the upper border of the areola	Ptosis with one-third or more of parenchyma below level of anticipated IMF with patient standing; substantial sliding of gland over muscle; more stretched lower pole skin with A:IMF under max stretch 7–8 cm or constricted lower pole breasts	Most sacrifice in lower pole muscle coverage to allow maximal contact of implant against gland; allows for maximal scoring/reshaping of gland to allow maximal expansion

Likewise, a DP I, involving only the release of the pectoralis along the inframammary fold, can be undertaken from the transaxillary incision. Unlike a blunt and blind transaxillary approach which risks uneven release of the muscle and imprecise level of the inframammary fold, a true DP I transaxillary should be done with a bloodless, endoscopic technique. Creating a DPII or III, however, involves retrograde dissection from the transaxillary incision. This remains on the technical fringe at this time, and should be undertaken by surgeons experienced with endoscopic transaxillary partial retropectoral pocket creation after experience with the dual plane for a variety of situations from the inframammary incision.

IMF approach

See **Fig. 54.13**.

The first step is to determine the ideal position of the inframammary fold. It is calculated from the nipple with the tissue placed on maximum stretch. In general, the standard of 7 cm for a base width of 11 cm, 8 cm for a base width of 12 cm, and 9 cm for a base width of 13 cm holds true. If the inframammary fold is already at that height, it does not need to be altered.

An incision is made at the proposed inframammary fold. Dissection is carried straight down to the muscle fascia with the electrocautery, taking care not to skive inferiorly. There is a natural tendency of the cut edge of the tissue to pull inferiorly, so the dissection may angle superiorly, but only for the purpose of not undercutting the skin edge and inadvertently lowering the fold more than intended, if at all.

The fascia is scored carefully with the cautery, so that the muscle is visible. Place in a double-ended or army-navy retractor with the tip pointed towards the medial border of the areola. With no horizontal dissection yet made, there will be little to hold the tissue up onto the blade of the retractor, so use the ulnar fingers of the retractor holding hand to pull the tissue onto the blade. Lift up towards the ceiling. Only the pectoralis will tent up. If the muscle does not tent at this point, it may be that the muscle is tight, or it may be that it is not the pectoralis. To ensure that it is pectoralis, and neither serratus, rectus, nor intercostals, touching it with the cautery will make the pectoralis in the upper chest contract. If still not clear, only then dissect just a couple of millimeters along the muscle surface in a cephalad direction. These are the important fibers that you want to preserve in order to hold the muscle down after you release along the inframammary fold, so sacrifice no more than necessary for the anatomy to be clear. This will allow you to see the fibers of the muscle, and allow some tissue to lie over the blade of the retractor, thereby allowing the pectoralis to tent up.

Again advance the retractor blade to the edge of the muscle, pointing the blade to the medial border of the areola, pulling the breast tissue onto the retractor, and lifting toward the ceiling. Because it is loose on its deep surface, the pectoralis will tent upwards. Holding your hand down onto the abdomen so that the cautery is horizontal, sweep gently the taught pectoralis fibers that appear vertical in front of you. Use hand switching monopolar forceps, as it allows precise control of blood vessels by squeezing, but so too can it be held together and used as a Bovie pencil.

So long as it tents, it is pectoralis. So long as your cautery is horizontal and parallel to the chest wall, the chest is safe. Keep advancing the retractor forward and lifting up after every stroke of the cautery. With each motion of the cautery and repositioning of the retractor, the muscle will tent higher and the plane through the muscle will become more obvious.

With this maneuver, you will very quickly get through the muscle, and will see the subpectoral space. Free up areolar tissue that is immediately in front of the incision, and then turn the retractor blade medially along the inframammary fold towards the sternum. Controlling the tension of the retractor blade on the muscles with fingers on the outside of the breast, use the cautery to take down the muscle about 1 cm above the proposed inframammary fold. This may serve as a shelf to help support the implant; it prevents over lowering of the fold; and it allows point coagulation of intramuscular blood vessels. Cut through the muscle and the overlying fascia. This should be bloodless and very easy to visualize.

In fact, this dissection is so anatomic, that you should expect to be able to do it without needing to place a single four by eight into the pocket. Look beyond the tissue plane immediately in front of you, anticipating and seeing the perforators ahead of time.

Continue all the way to the sternum, but do not proceed up the sternum at all. If you are unclear where this point is, mark it with an "X" externally on both sides preoperatively.

Continue the dissection sweeping superolaterally, and then sweeping inferiorly. This helps to find the plane between the pectoralis major and pectoralis minor, which are more intertwined if the dissection in that area starts inferolaterally instead of superolaterally.

Irrigate with antibiotic solution and inspect the pocket. Take note of the long, narrow V-shaped trough where the muscle was released inferomedially and window shaded a bit superiorly. Inspect where the cut edge of the pectoralis is relative to your incision; sometimes it is just a few millimeters beyond it, and sometimes it is already window-shaded several centimeters. This will vary based upon how cleanly you got through the pectoralis and how tight the given patient's connections between the pectoralis and breast tissue are.

Place a finger in the incision and feel the lower border of the muscle and lift up, taking note of the position of the muscle through the skin as shown by the position of your finger. This inspection process is not just important in order to define what you need to do for that specific patient, but done repeatedly, it provides the surgeon with a valuable experience about the dynamics of the muscle and the soft tissue.

If the intention is to do a dual plane I, by virtue of the muscle release, the dual plane portion of the dissection is complete. The implant can be placed and the incision closed.

If the goal is to do a dual plane type II or type III, then now is the time to do a release. This release is gradual and incremental. It cannot be overstated that substantial differences in position of the caudal edge of the pectoralis are created by just several millimeters of dissection. Surgeons ask

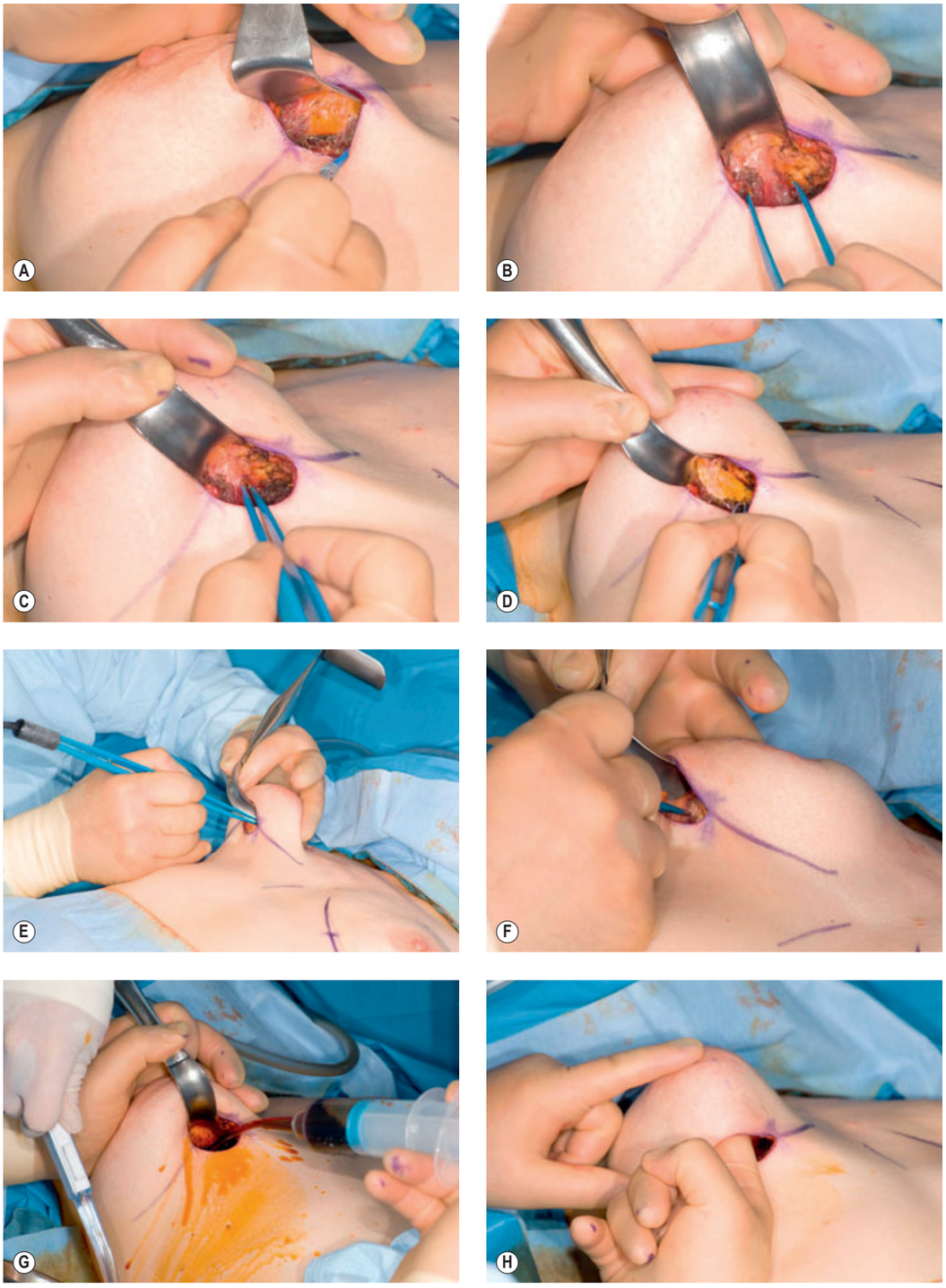

Fig. 54.13 A&B, After the retropectoral pocket is made, the pectoralis is divided 1 cm above the proposed inframammary fold. Note the use of the ulnar digits on the retractor hand pressing the muscle under tension so that it splits as it is divided. The superior and inferior cut edges are visible. When this is divided up to the sternum, a dual plane I will have been created, as shown in this photo. Depending upon the tension of the tissues, the muscle will window shade up a centimeter or two; in this case the muscle is about half the width of the retractor blade above the IMF. **C**, To go from a dual plane I to a II or III, the fibrous connections between muscle and the overlying parenchyma must be taken down. Just a few sideways swipes with the cautery is enough to cause significant movement of the muscle. **D**, After just a few swipes of the cautery freeing up some attachments of the muscle to the gland, the muscle moves cephalad. The fresh yellow fat shows the significant motion of the muscle relative to the last photo. Again, note the use of the ulnar digits against the retractor to create tension at the muscle parenchyma border, thereby making the dissection more precise and facile. **E**, When converting to a DP I to a II or a III, note how the hand and the retractor are used as a unit to create tension at the muscle/parenchyma interface. **F**, Here the release is being done more laterally. It can be adjusted on each breast exactly as the conditions necessitate. **G**, Copious irrigations with "Adams" solution (50 mL Betadine, 80 mg gentamicin, 1 g Ancef in 500 mL NS) is used throughout the operation. Note the yellow fat visible just beyond retractor; cut edge of muscle is just visible. **H**, In this case, the muscle is released to the lower border of the areola, which is a so-called dual plane II. When it is released to about the upper border of the areola, it is termed a DP III.

why they can't dissect between the muscle and the gland before the muscle dissection, and the reason is that such small amounts of dissection result in such significant movement of the muscle, that it is impossible to predict where the muscle will end up before dissecting the pocket and releasing the IMF.

With the curved end of a double-ended retractor placed in the incision, abutting to the caudal edge of the muscle, but with only breast tissue within it, use the other fingers in the retractor hand to push in on the breast, so that together with the retractor, it is putting tension between the muscle and the overlying gland.

Visualize the fascial connections between the muscle and gland, and use the cautery to gradually cut these, using sideways sweeping motions. You will see the muscle quickly pull away from the retractor and slide upwards. Once it does this even for several millimeters, move the retractor medially and laterally and repeat this process where you feel there is restriction by the muscle.

Rather than repeating this motion in the same area, keep moving around, as this will give the most control over the final position of the muscle.

While illustrations suggest dual plane type I, II, and III as distinct entities, they are part of a continuum of options. Their designations are designed as a guide to enable us to think about a clinical situation and compare notes. But in any given patient, the muscle does not necessarily end exactly at the lower border of the areola (type II) or the upper border of the areola (type III). Rather, the release is made to the extent that is necessary to achieve the exposure of the implant to the gland of the breast.

The most important point is not to overdo it. You can always release more, but once it is released, it is difficult if not impossible to pull the muscle back down. Put your finger back in as you did before, and note the chance in position of the muscle relative to before you did the release. Feel all along its edge, and go back and release more where you feel it is necessary.

If you feel bands within the breast that are restricting expansion, such as with a constricted lower pole, or when the IMF had to be lowered with a tight IMF, now would be the time to score the lower pole, much as you might have done with a submammary pocket.

Irrigate again with antibiotic solution, recheck for bleeding, and place the chosen implant close per the usual routine.

Postoperative care

With precise visualization of the pocket, no special bras or straps are necessary to try to push the implant into a pocket. Tape or a Steri-strip over the incision is the only dressing that is used.

With bloodless dissection, no special bandages are necessary to create compression, and early motion is not just allowed, it is ordered. Patients move their arms over their head in the recovery room in a gradual jumping jack type of motion. They go home, take a nap, and then are instructed to continue their exercises every hour while awake, take a shower, and leave the house for dinner. They may drive a car when they feel that they can safely make unrestricted movements, which is usually in two to four days. They are encouraged to do all normal daily activities that do not involve particular exertion, such as opening and closing car doors, putting on a seatbelt, lifting a baby, emptying a dishwasher, or making dinner. They may return to the gym after three weeks, though some surgeons allow this after two weeks.

With gentle, precise, and bloodless dissection, patients are only given narcotics through their time in the recovery room, and are managed over 95% of the time with ibuprofen alone at home.

Complications

There is no complication of dual plane that has not been well-described with either the submammary or partial retropectoral operations. The issue with dual plane is not that there are new complications, but that the patient and surgeon understand its limitations. So long as these trade-offs are well understood preoperatively, they are accepted later.

For instance, in cases of extreme mobility of the breast over the underlying chest wall, inferior sliding of tissue may still occur with the dual plane approach. It is my impression that in extreme cases of laxity this may occur more with the dual plane than the submammary approach, but this is difficult to quantify because even the submammary approach does not always totally solve the problem.

Though dual plane can reduce muscle animation relative to partial retropectoral, it cannot eliminate it to the same extent as the submammary pocket. Patients need to be aware of this, and make their decision about the pocket they prefer.

Pearls & pitfalls

Pearls

- When you have a choice in breast augmentation, always prioritize coverage. This will make the breast more natural in the short term and reduce the likelihood of difficult to correct long-term problems.
- Point out all limitations a patient's pre-existing anatomy poses on her result preoperatively. This will help her to let you do what you think is best for her, and will prepare her to accept trade-offs and shortcomings in her result later.
- With the dual plane, dissect a partial retropectoral pocket first. The more directly you are able to get behind the muscle, the less it will move superiorly after muscle division.
- Do not force yourself to choose which type of dual plane you will do; these are not so much distinct entities as points on a path. You should feel the breast during the dissection and adjust the dissection accordingly.
- Demand of yourself to make a gentle and bloodless pocket dissection so that your patients have an easy recovery.

Pitfalls

- The dual plane is not perfect, and though it maximizes most of the advantages and minimizes most of the disadvantages of either the submammary or partial retropectoral pockets, neither the surgeon nor the patient should think that it is perfect.
- It is easy to over-dissect the attachments between the muscle and gland; avoid excessive dissection in that plane before dividing the pectoralis along the IMF, and then only release gradually and incrementally.
- Do not release the pectoralis ever along the sternum; it creates deformities that are difficult to correct.

Summary of steps

1. Partial retropectoral: Pectoralis origins left intact along sternum and IMF.
2. Dual plane type I: Pectoralis origins left intact along sternum, but divided along the IMF.
3. Dual plane type II: Same plus pectoralis released from overlying gland and allowed to slide to about the lower border of the areola.
4. Dual plane type III: Same plus greater release of pectoralis from gland, allowing it to slide to about the upper border of the areola.

Further reading

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