Surgical Approaches to Hair Restoration

Editor’s note: My thanks to the moderator, James E. Vogel, MD (board-certified plastic surgeon, Baltimore, MD), and to panelists Michael L. Beehner, MD (board-certified family practitioner and credentialed in hair replacement surgery, Saratoga Springs, NY); Robert M. Bernstein, MD (board-certified dermatologist, New York, NY); and Martin G. Unger, MD (plastic surgeon, FRCS, Toronto, Canada) for sharing their opinions and clinical experiences.

Dr. Vogel: The first patient is a 33-year-old man (Figure 1, A). His main concern is in the crown region, but he is also concerned about his hairline in the front. On examination, he is a Norwood class V or VI (Figure 2). He has average scalp laxity, average donor density, and wavy, light brown hair of medium to fine quality. He has had progressive baldness over the past 16 years. He tried Rogaine® a few years ago and had a good response to it. Dr. Unger, how would you approach treating this patient?

Dr. Unger: In view of the fact that he is 33 and that his baldness is progressive, I would plan for the worst. In keeping with that, I would want to perform some form of a scalp reduction if the patient agreed. This could be done either in one operation or as two procedures. If his laxity is average, my goal would be to make this area approximately half its original size and then transplant the remaining area.

Dr. Vogel: What type of incision would you use for your scalp reduction?

Dr. Unger: Because his swirl is on the right-hand side, I would use a C-shaped pattern: a lateral type of pattern on the left-hand side and repeat that on the second reduction if I were performing two standard-type reductions or “modified majors,” as I refer to them. Alternately, one could use a single Unger PÂTÉ-type procedure (prolonged acute tissue expansion or intraoperative tissue expansion). The third option would be to use a Frechet extender for the two separate operations.

If the patient’s laxity is average, I probably would perform two scalp reductions spaced 3 to 4 months apart, although it could be a longer time frame depending on the patient’s preference. Then I could start transplantation as soon as 1 month after the second reduction and perform the second transplantation 4 months after that.

In transplantation I would use minigrafts, which I define as grafts of three to four hairs. I would put them into slit receptors with the area half its normal size or half the size shown here. I believe that somewhere between 100 and 150 minigrafts per session should give the patient excellent coverage.

Dr. Vogel: Dr. Beehner, how would you approach this case?

Dr. Beehner: I would first spend some time convincing the patient of the importance of the front and the top parts of his balding problem. Looking down from the top (Figure 1, B), it’s clear to me that eventually the patient will likely be at least an intermediate Norwood class VI, with even the possibility, at 33, of becoming an advanced class VI. He doesn’t look like a class VII in the making.

My treatment would be conservative. I would not transplant the vertical portion of his crown-vertex. It appears that part of the patient’s vertex extends onto the horizontal plane a little. I certainly would be willing to partly reduce the size of the vertex anteriorly with grafting.
would want to bring the concave line that can be seen toward the back of the midscalp somewhat posteriorly, and fill it in artfully with some follicular units and some four-hair minigrafts placed in 1.3 mm recipient holes. Before going any further, I would like to define what “follicular units” are: They are small grafts consisting of the number of hairs naturally occurring in individual groups on the scalp. Most of them are usually two-hair units, and a smaller percentage will be one- or three-hair grafts. Rarely four- and five-hair grafts are seen also. These percentages vary greatly from patient to patient. The difference between a “follicular unit” and a “micrograft” is that the follicular unit is always an “intact” natural grouping of hairs (one to four per), whereas a micrograft has always been considered as any graft consisting of one or two hairs, regardless of whether it was such an intact unit or had been split off from a larger group.

I would not perform a scalp reduction on this patient, partly because I believe his balding will become progressively greater, and I do not know what his eventual pattern will be. Also, he’s described as having “average” laxity, and in my practice I only perform scalp reductions when the laxity of the scalp is greatly above average and the scalp is thick. Once this gentleman turns 40, and if his fringes all stay the same, including the crown-vertex, then I would consider transplanting some follicular units in the vertex with a whorl pattern. To accomplish this, I would use about 160 such grafts at each of three to four sessions.

For now, I would offer to transplant the entire front area and the midscalp and end my grafting at the most posterior aspect of the horizontal midscalp area. I would try to convince the patient to wait a few years on the crown-vertex and possibly recommend that he style his hair backward to help cover that area. I might also recommend finasteride or Rogaine®. According to the original history, the patient had a good response to Rogaine® a few years ago.

**Dr. Vogel:** Dr. Bernstein, how would you approach treating this patient?

**Dr. Bernstein:** Although the patient’s predominant complaint is the crown, I would stress the importance of establishing a permanent frontal hairline and adding coverage to the frontal portion and top of his scalp in the first procedure. Because he is a Norwood class V/VI, the bridge of hair that separates the crown from the front of the scalp (and that defines the class V patient) is unstable and will likely be lost in the future. The entire thinning area extending from the frontal hairline to the point where the head starts to slope backward (the vertex transition point) should be viewed as a single cosmetic unit and should be transplanted, although more lightly in areas where there is some existing hair. This would require approximately 2000 follicular units. I would perform the transplantation exclusively with the patient’s individual naturally occurring follicular units.

“In my practice I only perform scalp reductions when the laxity of the scalp is greatly above average and the scalp is thick.”

—Michael L. Beehner, MD
consisting of one to four hairs each. The smallest units would be used to create a soft frontal hairline.

If the patient wanted only the crown transplanted, I would place about 800 to 1000 follicular units in this area, but I would encourage him to consider the transplantation of the cosmetically more important areas first. With regard to the stopping point at the posterior aspect, I agree totally with Dr. Beehner. To be conservative, one should not initially transplant the crown or attempt to decrease its size with a scalp reduction. Any surgery in this area would commit the patient to further procedures, and at age 33 it is impossible to determine whether the patient will have enough donor reserves to keep the crown looking natural and also provide adequate coverage to the front and top of the scalp, if he were to bald extensively.

If you limit the placement of hair anterior to the crown, that is, to the "vertex transition point," you can be assured that the patient's transplant will always look natural, regardless of how bald he will become. Once this area has an adequate amount of permanently transplanted hair or you are secure that
his reserves are sufficient to address future balding, transplantation of the crown can be accomplished by recreating the whorl pattern with individual follicular units.

**Dr. Vogel:** Dr. Unger, is it possible to hide the scar in the crown region with the transplantations that you would propose to perform subsequent to the scalp reduction?

**Dr. Unger:** Yes. On the basis of my experience, with more than 9000 patients over almost 25 years, there hasn’t been a patient on whom I haven’t been able to hide the scar adequately. The key is to close the incision with minimal tension and following the hair direction. You don’t want the hair to go in different directions on either side of the incision except when there’s absolutely no other choice.

**Dr. Vogel:** Dr. Bechner, one of the questions that arises in looking at this young man with a hair loss pattern that is obviously progressive to some degree is, what are the most important factors used to predict the progressive nature of baldness?

**Dr. Bechner:** I would certainly ask him about his father and possibly any brothers to determine whether his baldness is occurring in the same time sequence as theirs may have. I would carefully examine the temporal and parietal fringe hair. The photographs show it to be of reasonably good quality. If he had a “see-through” type of fringe and “whisker hair” around the ears, those factors might portend that he will bald a great deal more. On the basis of the rate at which this patient is balding, gradually over 16 years according to transplant this area, if the patient wanted to be convinced of how large that area was going to be, I would wet it down and hold mirrors up for him to see it himself. I also often take a picture of this wetted down view, which shows this eventual balding margin even more clearly.

**Dr. Vogel:** Dr. Bernstein, do you have any other thoughts on how to predict the progressive nature of a patient’s baldness?

**Dr. Bernstein:** I like to ask the patient if he is following the pattern of any specific close family member with regard to the extent of balding and the age at which it occurred. If there is a match, this would give me some sense of how his baldness will progress. I find other historical information to have less predictive value. Certainly, the patient’s personal history, with regard to the onset and rate of hair loss, is important and has greater significance with increasing age.

In addition, I would measure the degree of miniaturization in the upper portion of what appear to be clinically stable areas. Miniaturization is the amount of finer hair admixed within the thicker, terminal hair that represents those follicles nearing the end of their life span. If that number is greater than 20%, it suggests that the area is unstable and the balding is likely to expand.

**Dr. Vogel:** Dr. Unger, is there a concern for the surrounding area, losing

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**Figure 3.** A 36-year-old man who is interested in having as much coverage as possible.
vellus hair in the present, rather than at the time of a scalp reduction or a concurrent or subsequent hair transplantation?

**Dr. Unger:** I'm not terribly worried about that. I'm assuming the worst. I'm assuming that he is going to go on to a full Norwood class VI. I don't think he's going to go on to a Norwood class VII because of his age, the slow nature of his hair loss, and his family history. Even if he goes on to class VI, I would do a reduction, so he will have a very ample number of grafts to take care of the remaining area in the mid-scalp and crown and also to transplant the front without a problem.

The one thing I should qualify is that I'm assuming that this patient wants coverage as dense as possible in all areas. If the patient only wants very thin coverage, then I would go the route that Dr. Beehner and Dr. Bernstein have recommend—follicular grafting only. I believe people should understand that with follicular grafting, most grafts are two to three hairs, not three to four. Therefore it gives very thin coverage.

**Dr. Vogel:** The second patient is a 36-year-old man, who's interested in having as much coverage as possible (Figure 3). He has red hair that is slightly wavy and wiry. His scalp laxity and donor density are average. Dr. Bernstein, what would you do to provide this man with as much hair coverage as possible?

**Dr. Bernstein:** In the first session, I would transplant approximately 2400 follicular units. Approximately 1000 would be placed in the frontal portion of the scalp, with 300 of these in the frontal hairline, and would consist of one- and two-hair follicular units. Three- and four-hair units would be placed behind them, and I would expect about 10% of the total follicular implant population to be four-hair grafts that could be concentrated in the front-central portion. The rest of the grafts would be distributed over the top of the scalp, with the posterior aspect feathered similar to the front.

I would plan a second transplantation 8 to 12 months after the first session and use the second procedure to add density and fullness to the areas covered in the first, with a similar number of grafts. I would also extend the transplantation posteriorly to provide light coverage to the crown. Two procedures totaling 4800 follicular units should be enough to provide the patient with an excellent result. I would not perform any additional surgery unless his baldness progressed.

**Dr. Vogel:** Dr. Bernstein, how long would it take you to perform a graft session of 2400 grafts?

**Dr. Bernstein:** Approximately 8 hours.

**Dr. Vogel:** Dr. Unger, how would you approach treating this patient?

**Dr. Unger:** Well, my approach would be totally different. I would use a combination of hair transplantation and scalp reduction surgery. I would want to reduce the area of the midscalp and crown region, and even a little bit of the front third. I would want to remove at least 50% of the area. I believe a Y-shaped pattern (Figure 4) for scalp reduction would be an excellent choice. It would also bring up the occipital area anteriorly. Having reduced that area, I would then transplant the remaining area much more densely, because the same donor area is available to cover a much smaller region.

I believe we all use micrografts, one- and two-hair grafts at the hairline (a transitional zone), and, as Dr. Bernstein pointed out, probably 250
to 300 grafts with each transplantation. Behind that, minigrafts of normally three to four hairs are used, and behind that, even denser minigrafts of five to six hairs. In general, perhaps an inch of micrografts; then an inch of the smaller minigrafts, which I like to put in slits only; then perhaps another inch of the larger minigrafts (of five to six hairs), and then behind the first three inches, only minigrafts of three to four hairs. I would do all of this in six operations—two scalp reductions, two operations to transplant the front half and two operations to transplant the back half.

If the patient did not want to accept scalp reduction right away, I might transplant the front third initially and then do a scalp reduction after that. With most patients, once you gain their confidence, they will follow your advice.

**Dr. Vogel:** Dr. Unger, you have mentioned doing two scalp reductions with a Y-shaped incision. Of the different modalities to enhance the speed or effectiveness of the scalp reduction, such as a tissue expander, intraoperative expansion, or an interoperative prolonged stretching device such as the extender, what tool, if any, would you use to enhance your scalp reduction?

**Dr. Unger:** I normally use tissue expansion, prolonged acute (intraoperative) tissue expansion (PÂTE). I find with PÂTE I get almost as much expansion as with an extender. Certainly that’s what I have more experience with than, for example, the Star device or other methods. They’re all good, and certainly the important thing is removing roughly 50% of the bald area. That’s my goal.

**Dr. Vogel:** Dr. Beehner, how would you approach treating this patient?

**Dr. Beehner:** The patient is 36 years old. I would be conservative, although he’s only 4 or 5 years away from an age at which I’d be more aggressive. At this time I would still keep open the possibility that the transplanted area may evolve into an isolated frontal-midscalp hairlock, even though I think that is unlikely. I would certainly connect the two side fringes now and I would use a “central density concept.” By “central density concept” I refer to transplanting in circumferential zones featuring larger minigrafts centrally, smaller minigrafts in the encircling intermediate zones, and micrografts in the outermost zone. I believe you must create a gradient. One area has to be denser than another, because this is the way men’s hair naturally thins. I don’t believe you can adequately do this using only follicular units—at least not in my experience. I can’t say I’ve used them exclusively over the entire bald scalp, but I have certainly used them in the frontal hairline zone and don’t believe they will provide the density that I want centrally.

I would certainly tell this patient that I think it’s important cosmetically to avoid transplanting the posterior vertex area. Again, I would not perform a scalp reduction because he’s been described as having “average” scalp laxity. If he had outstanding laxity and a thick scalp, and if the patient really wanted the crown-vertex addressed, I, like Dr. Unger, would consider the scalp reductions.

When performing a scalp reduction, I like the “lazy-S” pattern (Figure 5). I would curl the back of the “S” in the shadow of his posterior fringe. However, I’d feel much more comfortable doing this once the patient reached his forties.

**Dr. Vogel:** Dr. Beehner, what size grafts would you use?

**Dr. Beehner:** I would use approximately 280 follicular units in all,
with about 130 of them along the frontal hairline, 90 posteriorly along the edge of the oval forelock design, and 60 in the two posterior parietal triangles (Figure 6). I would have this oval “connected” forelock brush up against the temporoparietal fringe laterally with small minigrafts.

**Dr. Vogel:** Could you specify the number of grafts?

**Dr. Bechner:** In addition to these follicular units, I would place in the outermost minigraft zone about 160 four- to five-hair grafts (these are larger than my colleagues are describing), in 1.5 mm holes. Within that, I would have another zone of approximately 60 five- to six-hair grafts in 1.8 mm holes. Then centrally—especially because he has wiry hair—I would use about 20 larger minigrafts of seven to nine hairs in 2.0 mm holes. I anticipate he would need four sessions. If the patient’s hair was darker, I would adjust these graft sizes downward.

**Dr. Vogel:** Dr. Bernstein, what percentage of the grafts that you place do you expect to grow?

**Dr. Bernstein:** Over 90%, but the exact number is not known.

**Dr. Vogel:** Dr. Bechner, what is the percentage in your hands?

**Dr. Bechner:** I think it’s more than 99% for minigrafts. For micrografts, it has always varied tremendously, ranging anywhere from 75% to 95%. Recently, we’ve switched to using all intact follicular units, as I have already mentioned, and with these we are expecting that number to be in the upper 90 percentile.

**Dr. Vogel:** Dr. Unger, what percentage of grafts in your hands survive?

**Dr. Unger:** I’ve never actually done a study where I’ve counted the hairs, but I expect 100% of the hairs that I transplant to grow. I certainly get that impression grossly. Dr. Bechner mentioned the S-shaped pattern. I believe that is an excellent alternative to a Y-shape in an individual like this, especially if there’s going to be any considerable time between the reductions.

**Dr. Vogel:** I would like to add another option that has not yet been mentioned: a traditional tissue-expanded hair-bearing flap. This could most easily be done as a triple advancement transposition flap (TAT flap). Naturally the patient would need to be counseled with regard to the procedure, the tolerance level, and so on.

**Dr. Unger:** It’s a very good option. The trouble is, I’ve found in my own practice, that most people will not accept the deformity of chronic tissue expansion.

**Dr. Vogel:** I agree with that. Dr.
Unger, some people say that scalp reduction preserves donor area for later use in hair transplantation. Others have said that it actually provides a false sense of security and may even limit the amount of donor area available. Can you comment on that, please?

Dr. Unger: Like anything good, if you overdo it, it can be harmful. If you overdo scalp reduction, you run into problems with hair direction, thinning of the donor area, wide scars, and so forth, all of which are undesirable. On the other hand, if you’re conservative, if you do this with minimal tension, you get fine scars. That’s why I advocate 50% of the area being removed, not 100%.

Dr. Vogel: Dr. Bernstein, what is your opinion on this issue?

Dr. Bernstein: I have a different opinion. The real issue is not one of minimizing complications; that can be accomplished with excellent surgical technique. The problem is that whenever the donor area is stretched, an inevitable consequence is that the donor density drops and the scalp becomes tighter. This may not always be noted on casual observation, but it can be easily observed when density is actually measured. Because donor density and scalp laxity are the two critical factors that determine how much hair can be harvested from the donor area, decreasing these factors will limit the amount of hair available for the cosmetically more important areas at the front and top of the scalp.

Dr. Unger: When you move the lateral fringe up onto the top of the head, you’re moving a density of 450 hairs/cm². The greatest you can get with transplantation is probably about 200 hairs/cm², so I totally disagree with Dr. Bernstein.

Dr. Bernstein: What Dr. Unger is stating is exactly the problem with reductions. If a density of 450 hairs/cm² is moved to the top of the head, huge amounts of donor hair will be consumed in the process, especially because the average patient’s donor density is closer to 230 hairs/cm². This places the patient at significant risk of running out of the donor hair that may be needed for subsequent procedures, especially in the front. Remember, we are treating patients who are balding, that is, they have less total hair volume, so restoring the original density should not be the goal. What I prefer to do is have the greatest density in the anterior position of the scalp, especially in the central-anterior portion. Although one is not limited to 200 hairs/cm² when transplanting, if multiple procedures are performed, I don’t believe that transplanting more than 200 hairs/cm² is appropriate, because this number is already close to the average patient’s original density.

Dr. Vogel: Dr. Beehner, do you find a role for the new drug finasteride in your patient population?

Dr. Beehner: I plan to use it as an adjunct, particularly in men in their thirties and forties who are still balding and want to slow things down. I think it can be a valuable adjunct to transplantation.

Dr. Vogel: Dr. Bernstein, what are your comments on this?

Dr. Bernstein: I agree and also believe it will be very useful for younger men who are bothered by the first signs of hair loss but are too early in their balding to be candidates for surgery.

Dr. Vogel: Dr. Unger, at what age do you believe a patient is too young to be considered for hair restoration surgery?

Dr. Unger: As a matter of fact, if it’s warranted, I will perform hair restoration surgery on a patient in his late teens. We have to plan for the worst. In situations like that, what I’d really like to advocate is a forelock, as described by Dr. Beehner in the literature. I prefer not to get into scalp reductions until the patient is at least in his mid twenties.

Dr. Vogel: Dr. Beehner, what is your response to that question?

Dr. Beehner: I like to use age 23 as a cutoff, but I believe a little bit the way Dr. Unger does. You want somebody who’s stable, who has a realistic view of what’s going to happen, and who accepts the limitations of the procedure.