ADVANCED LEARNING TECHNIQUES

This section is intended both for patients to explore some of the various techniques available, and for physicians to learn some of the finer points I have picked up over the past 4 decades.

Better Anesthesia
In the early 1990s I had a patient who was also a cardiovascular surgeon. At the time, I was using a mixture of 1% lidocaine and 1:100,000 epinephrine for anesthesia. He suggested that I should add an ampule of sodium bicarbonate to the anesthesia to raise the pH from about 4.5 to 7.5, thereby reducing the burning associated with the injections.

In fact, the pain was subjectively reduced by at least 70% but post operatively he had very significant edema at his forehead and eyebrows for 3 days.. What happened was that the additional sodium drew water out of the capillaries by osmosis, so I tried another approach. This time I started with 50 ml of 1% lidocaine without epinephrine and added 0.5 ml of 1:1,000 epinephrine immediately prior to surgery. This worked like a charm. The pH was very close to normal body pH, the epinephrine did not break down for several hours, the pain was reduced 70-80%, and virtually no edema resulted.

Better Survival of Transplanted Hair
Much has been written and talked about with regard to survival of transplanted hair. In fact, most conferences spend at least a half day talking about the latest solution to soak grafts in or treat them prior to implantation. At first this was puzzling to me because I have always used a 0.9% sodium chloride solution and never had a problem with hair growth.

Then it dawned on me how many other factors there are that influence survival that have gone unrecognized for far too long. The one factor that is at least as important as a natural looking result is that the grafted hair *survives*.

The latest craze in hair transplantation is the revolutionary follicular unit extraction technique, or FUE, where small grafts are removed one by one from the donor site. Whether removed by robots, suction punches or non-medical, contracted personnel, the only thing different from 1952-era punch harvesting is that the grafts are smaller. But even the size is nothing new; my first mini-grafts in 1985 were punch harvested.

Virtually every well-constructed head to head comparison between FUE and strip harvesting has shown better survival of follicles with strip harvesting. But why is this? First of all, trying to cut the full depth of a 4mm long follicle with a 0.7-1.0mm diameter punch is extremely difficult, but to do this with an entire follicular unit is virtually impossible. I attended a conference some time back where a number of FUE surgeons showed close-up photos of their grafts. Calculating the average number of hairs per graft I found that the best surgeon among them averaged only 1.7 hairs per graft. An intact follicular unit should average nearly 3 hairs per unit.

Another unrecognized advantage of strip harvesting is that it often pulls more usable hair into the donor area. Even patients with extensive male pattern alopecia usually shave or cut short the hair at the nape of their neck. When a strip of donor is removed and sutured, the skin above and below the cut is pulled together. About 60% of this movement is simply stretching skin along the immediate margins, but approximately 30-35% is accomplished by raising the hairline at the back of the neck. This skin is much more mobile than the skin above the donor incision and allows for more usable hair to be pulled up into the donor area. Incidentally the scalp *above* the donor site is very immobile and is not pulled downward, and therefore does not increase the size of the balding crown above.

When FUE harvesting is done with punches, the resulting holes actually open larger than the size of the punch. Because the scalp is under tension, a 1.0mm hole opens up to an approximately 1.5mm hole. Unless sutured, this creates a slight sag in the donor scalp, the rear hairline drops, and there is a net *loss* of future donor hair.

But this is only harvesting. How many hairs actually survive? Again the study results have not been encouraging. But why? First of all, a lot of hairs get sectioned when cutting small grafts, but how many of these survive? In the early 1990s I did a study where I created 1, 2 and 3-hair grafts, trimmed to where they had no partial hairs attached. Then I cut the grafts in half at the midshaft and implanted the bottom half on one side of the crown, and the top half on the other. Two years later the growth count showed that 40% of the hairs were growing from the bottom half. The top half had about 20% growth, but interestingly virtually *none* of these hairs would grow more than one inch in length.

A more recent variation on FUE harvesting involves using blunt punches and/or making shallow cuts and pulling the grafts out. This creates a whole new set of trauma. Yanking grafts out causes traction trauma, and having to grasp the graft tightly causes crush trauma, as do dull punches.

Just cutting grafts smaller, whether using an FUE technique or strip harvesting results in reduced survival. Sectioning within follicular units destroys the neurovascular ring and smaller grafts have more traumatized tissue around the periphery relative to the intact tissue of the interior. In addition, they are more prone to crush injury and drying out.

A long held belief is that mega-sessions of densely packed grafts will result in a thicker more natural result. One of the first surgeons to do mega-sessions wrote a paper years ago describing complications in which he reported that 1-2% of patients ended up with no growth at all. Making too many recipient holes destroys the capillaries feeding the

new grafts. The only way they can survive is by diffusion of oxygen from deeper tissues and this is sometimes too much for them. Also, doing sessions longer than 6 hours begins to impact graft survival as the hair cells begin to die from hypoxia and lack of nutrients.

Female Pattern Hair Loss
A few years ago I was doing research on female hair loss. To my surprise I found that the majority of the doctors I spoke with said they didn't like doing transplants for female pattern hair loss because 50% of their patients experienced further (usually temporary) hair loss shortly after surgery. Their technique was the same as with male pattern, dense packing into recipient slits. I see this in about 1-2% of my female patients but my impression is that it mainly has to do with the fact that the dermis of most women's scalps is barely half the thickness of a man. The reduced number of capillaries results in less oxygen to the grafts, and spacing the grafts farther apart appears to solve this problem.

Another cause of substandard results for females is the use of slits for the recipient site. In male pattern hair loss, a thin result with space between the grafts is often acceptable. This is never adequate for women. I have yet to meet a woman who told me she had too much hair.

If the recipient site is created with a punch (FUT Plus) then a small piece of bald skin is removed and the intervening space between the existing hairs can be filled. In addition, since females never go totally bald, a slightly larger graft can be used. It fills the space better, it retracts less than a smaller graft, and it never looks *pluggy*.

Recipient Holes vs Slits
The obvious downside of making recipient holes is that the bald plug has to be removed and this adds extra time to the procedure. Other than this, holes have numerous advantages over slits.

First of all, there is bald skin being removed. Secondly, a hole is more the shape of the graft it is receiving than a slit. The grafts must be cut smaller to fit into a slit and this is often why the grafts are sub-follicular unit in size. Even with fewer hairs, the slit tries to close up and pushes even 2 hairs closer together. They often end up growing out of one hole creating an effect known as "bouqueting", like the multiple stems of a bouquet in a single vase.

Grafts placed in slits can make varying angles. Because the slit is elongated, some hairs grow out at a shallower angle, others more steeply. In addition, the ends of the slit have to fill in with scar tissue and when it does the angle of the hair is raised by the retracting scar, making it grow more at 90 degrees to the scalp rather than a more natural 45 degrees.

Better Hairlines
When I worked for Mr. Dan Latham back in the 1980s and 1990s I learned more about proper hairline placement from him than all the surgeons I have known put together. One of the biggest mistakes a surgeon can make is to let a young patient talk him into setting a hairline too low. Another mistake is to fill in the "angle" of a normal recession by rounding the hairline into the sideburn area. Both of these will look good while the

patient is young, but will never recede and will look awful in the decades ahead. In addition, the patient may run out of donor hair later. It is always better to set a high hairline and lower it later if necessary.

Many surgeons use the "rule of thirds" to divide the face. (1) from the bottom of the chin to the bottom of the nose, (2) Bottom of nose to bridge of nose, and (3) bridge of nose to hairline. This might work in the art world or for young faces, but if you were to use this to place the middle of a mature hairline you will inevitably place it too low.

I use a 45 degree tangent rule. First, place a comb or ruler on the forehead near the point of the hairline. When the comb sits at a 45 degree angle to the floor, mark that point. Second, move the comb to where the hair parts on the side about where it meets the frontal recession. Again this is about 45 degrees to the floor. The 45 degree point will almost always line up with the part and a line drawn from the most lateral point of the patient's eye. Repeat this on the other side of the hairline and you will have marked the 2 most lateral points that you should ever place a graft along the hairline. Now, connect the 3 points with a horseshoe-shaped line. The final shape of this line may vary depending on the shape of the patient's face and forehead.

Reduce Scarring

The number one reason proposed for doing FUE over Linear Strip Harvesting is to prevent creating a linear scar. This is absolutely true. But it does not create less overall scarring. In fact, it creates *much* more, hundreds upon hundreds of small circular scars throughout the donor area. As they heal, these scars do not shrink but in fact grow larger. The scalp is under tension and cutting a 1.0 mm graft will yield a 1.5 mm hole. In fact, you would have to leave a linear strip open and unsutured to create as much total scar as a comparable FUE procedure.

So what are the secrets to minimizing a liner scar? First of all, *only make 1 scar*. I have never understood why a surgeon would do 3 procedures and create 3 separate incisions. Second, check the elasticity of the scalp before cutting, then make the strip narrow enough so that you don't have to undermine. Excessive tension not only widens the scar but it creates suture scars along each side of the scar line. Third of all, don't cut too deeply. This creates more scar, both deep and superficially, and can cause excessive bleeding or nerve damage.

A good closure technique is the Trichophytic Closure which you can read about in many other places. I do a similar closure but have found that shaving off the superficial epidermis may not be necessary. When closing, I prefer to pull the upper edge over the lower by at least a half millimeter. Because the cuts were made at an upward angle of 45 degrees, the upper lip is thinner than the lower. As the donor site heals, this is going to retract anyway. Not overlapping is one of the main reasons for a widened scar.

Regardless of the procedure used, *all* surgery produces scarring. If your patient wants to shave his head after getting a hair transplant, I would recommend he not ever get a transplant.

Choosing a Surgeon

1. Choose a physician who has been doing hair transplantation for many years
2. Chose a physician who specializes in hair transplantation
3. Understand the procedure you are getting and make sure it is the right fit for you
4. Make sure that a physician is doing your procedure. I know of at least two clinics in my area which do surgeries without a physician ever being present