

# Patient Guide to Surgical and Medical Hair Restoration

an ePublication by [John P. Cole, MD](#), [Dr Paul T Rose, MD](#)  
and [M. Truett Bridges, Jr. MD](#)



## TABLE OF CONTENTS

- 1) [Introduction: All About Hair](#)
- 2) [Hair Loss: Causes and Conditions](#)
- 3) [The Natural History of Balding](#)
- 4) [Hair Systems: Yes or No?](#)
- 5) [The Psychology of Hair Loss](#)
- 6) [Medical Treatments for Hair Loss](#)
- 7) [Surgical Treatments for Hair Loss](#)
- 8) [Follicular Unit Transplantation: the State of the Art](#)
- 9) [The Donor Area: Out of Sight, Out of Mind](#)
- 10) [The All-Important Hairline: the Facial Frame](#)
- 11) [The Crown: Important or Not?](#)
- 12) [The Procedure Itself: the Nuts and Bolts of Hair Transplantation](#)
- 13) [Post-Operative Course: What to Expect, What to Do](#)
- 14) [Additional Procedures: When and How Much?](#)
- 15) [Long-Term Planning: the Absolute Necessity](#)
- 16) [Hair Restoration in Women](#)
- 17) [The Patient's Perspective \(From the Chair\)](#)
- 18) [Making Informed Choices \(About a Life-Long Decision\)](#)

# Chapter One

## All About Hair

### Social Impact and Aesthetics of Hair

What is it about hair? References to our “crowning glory” abound in our historical and cultural experience, a shared consciousness about what it means to have, or to *not* have, this most outwardly evident portion of our human anatomy. So why is hair so important to us, what is its significance and why do we universally care so much about it? Well, let’s examine some of these questions.

For one thing, it is so obvious. Rarely concealed by clothing, it is one of the first characteristics that other people notice about us. When someone asks for a description of an individual, here’s what usually comes to mind: “He’s a tall, blond guy, with long hair like a Viking”... “she’s a beautiful brunette”... “Medium build, dark, curly hair”... “an impressive shock of thick, white hair”... “light-skinned, with dreadlocks or cornrows”... “fat and balding”... “she’s a *real* redhead!”... “he was cute, with poofy hair like an ‘80’s rock star”.

Notice something common to all these descriptions of obviously quite different people? Sure, it’s the hair. Before eye color, nose shape, sometimes even before height and weight, people comment on hair: length, color, style, or the absence thereof. This is a large part of what we present to the world, like it or not. It is also inevitably present in our concepts of beauty.

The impact is powerful. We know that people with “outrageous” hairstyles considered outside the mainstream may have difficulties functioning in society at large. Our hair speaks to our social, professional, cultural, and/or religious affiliations, and is an important element of our self-expression. What is less well known is that bald or balding men are often regarded by society as older, weaker, more ineffectual, and are more likely to be passed over for promotions or raises than their peers. They are often seen as less desirable as potential mates, lacking in virility, and less capable of providing for a family. Even more significantly, balding men have lower levels of self-esteem than their peers, suffer more from depression, are less sociable, and are less likely to succeed in life (British Journal of Psychology, 1995).

Hair is inextricably woven into the fabric of our culture. Consider our common mythos: Samson and Delilah, Cleopatra, Prince Valiant, Rapunzel, Goldilocks; hippies, skinheads, mods and rockers, the Beatles (those ‘loveable “moptops” from Liverpool!’) Hair and hairstyles define entire eras (the 1960’s) and cultural movements. Likewise, religion and spiritual disciplines often consider hair, or its absence, of singular significance. Many sects of monks or nuns require shaving of the hair as a demonstration of

withdrawal from “worldly” pursuits into the spiritual world. Conversely, Sikhs and other religious groups prohibit any cutting of the hair at all.

So in our society, and in most others, there is an enormous symbolism attached to our hair. There are very few bald members of the United States Congress, many fewer than would be expected from a normal cross-section of our population. Our only truly bald president in the past 50 years was Eisenhower, who was enormously popular as a war hero. Imagine our cultural icons, our celebrities, even our animated Disney heroes: thick, luxuriant heads of hair are the desired norm. Why the great emphasis?

Consider the birds of the field (and the snakes in the grass, for that matter). Feathers, and scales, like hair, are appendages of the skin, similar modifications in different species. Brightly colored and obvious plumage and scales are important in mating and courtship rituals in the animal kingdom, are they not? They are expressions of gender and availability. We all smile at the image of the “strutting cock of the walk”, but in the rooster’s world, he’s the king! In our world, hair, an external form of living clothing, expresses much about us to the world. Our choice of styling, color, and length are, to some extent, outward signals of our innermost desires and deepest feeling about ourselves. The loss of this instrument of expression may, for some men and women, be devastating.

### Scientific Basis of Hair Growth and Distribution

In the following discussion, we will mostly be concerned with scalp hair. Although scalp and body hair share many of the same characteristics, it is balding that we seek to understand and remedy, so this will be the focus unless otherwise indicated.

Hair is a living entity, although the shafts we see are largely the extension, outside the body, of a dead protein called keratin. Beneath the level of the skin, however, there sits a powerhouse of cellular activity. This cell division and differentiation pushes the hair shaft outward; thus we see hair growth that averages about one half inch per month.

There are two types of hair: terminal and vellus. The terminal hairs are the thick, strong, usually pigmented ones that constitute the greatest volume of our hair. The vellus hairs are the very fine, short, lightly pigmented hairs, sometimes called “baby hairs”, that can be often detected around the hairline, and throughout the scalp, as well as the light “fuzz” elsewhere on the body. This difference is significant when discussing balding, for in balding, the terminal hairs gradually undergo a metamorphosis called “miniaturization”. They become shorter, finer, and less colored; in short, they become vellus hairs. If you look closely at the heads of balding men, you will see that, in many of the areas of balding, the strong terminal hairs are replaced by these

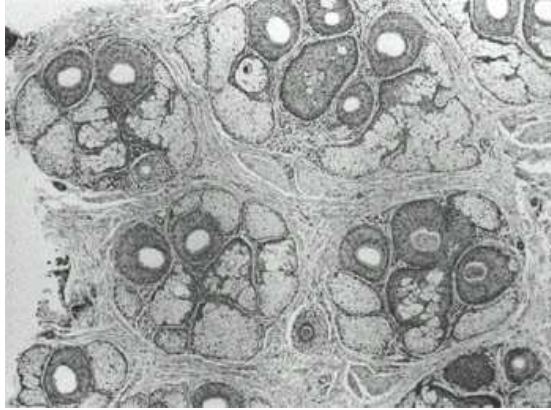
fine, vellus, “baby” hairs; this is miniaturization, and we will discuss this in greater detail in the next section on hair loss.

In addition to these two types of hairs, the individual characteristics of the hair are very important in determining appearance (including the appearance of balding) and styling options. These characteristics include color, curl or kink, caliber (cross-sectional area) and density (number of hairs per unit area). For example, although African hair tends to have a lower density (hairs per square inch) than Caucasian hair, its extreme curliness lends it a great volume and ability to achieve coverage after hair transplant surgery. Asian hair, although it tends to be very coarse (high caliber), may be more challenging to transplant due to the straight nature of the hair, and the contrast between dark hair and lighter skin. However, these are but a few examples, and all of these characteristics are taken into account by the hair restoration expert in designing a program for each *unique individual*. This is where the *art* of hair restoration meets the *science*.

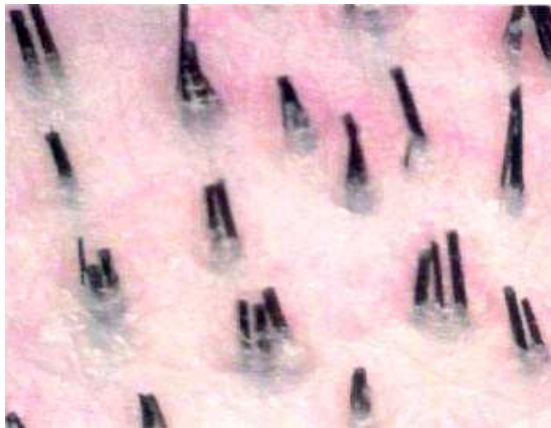
In addition to the hair shafts themselves, there are other structures involved in the growth and function of hair. Each hair is associated with a sebaceous gland, which produces the oily sebum that serves to lubricate the hair shafts. Likewise, there is an erector pili muscle, which contracts to raise the hair in situations of anger, fright or cold. Although this function serves little purpose in humans, we see it in other mammals when their “hackles” rise.

Hair growth and rest occurs in three phases: anagen, catagen and telogen. The anagen phase is the period of active growth. At any time, about 85 to 91% of hairs are in this active, anagen phase. Anagen may last from 2 to 7 years, but usually about 3 years on average. The catagen phase is considered transitional, and the telogen phase is the dormant, or resting phase. When the hair enters the telogen stage, the hair is either pulled out during normal grooming, or is pushed out when the new hair shaft growth begins.

Last, but certainly not least, is the anatomical and physiological unit we have come to call “follicular units”. If you have done any current reading on hair restoration surgery, you have surely come across this term. Believe it or not, it was only in the early 1980’s that it was recognized that hairs grew not as strictly single shafts, but as discrete groups of one, two, three, four, and rarely five terminal hairs. These hairs are joined by one or two vellus hairs, a sebaceous gland, an erector muscle, a neurovascular bundle (meaning the nerve and blood vessels), and the perifolliculum, or fine connective tissue sheath. These units are easy to see emerging from the skin under slight magnification on cross section through the skin (figure 1) or when the hair is clipped short (figure 2).



**Figure 1 (cross section)**



**Figure 2 (surface of scalp)**

The significance of recognizing follicular units as the fundamental grouping of scalp hair cannot be underestimated. This understanding has led to a revolution in the techniques of modern hair transplantation. The past decade has given us a whole new perspective on the harvesting, movement and implantation of permanent hair into areas of balding scalp. This can now be done, at least by well-trained surgeons and their operative teams, in a manner that is natural and undetectable. We will discuss this more, in greater detail, in later sections.

# Chapter Two

## Hair Loss: Causes and Conditions

There are many causes of hair loss in men and women, including disease, nutritional deficiency, hormone imbalance, and stress. However, by far the most common cause is what is called *androgenetic alopecia*. Alopecia is simply the medical term for hair loss. Androgenetic refers to the fact that both a genetic predisposition to balding, and the influence of androgens, or male hormones, play a part in this type of hair loss.

In fact, there is a third factor, which is the passage of time, or aging. In other words, in order for androgenetic alopecia to occur, there must be:

- 1) a genetic propensity for balding
- 2) the presence of androgens, or male hormones
- 3) enough aging time to allow the first two factors to exert their influence on the hair follicles

### Genetics

Genetics is not always simple, and such is the case with balding. Just the presence or absence of balding in one's parents or grandparents, on either the mother's or father's side, is not necessarily predictive of one's likelihood of balding. Certainly, if a man's father is completely bald, and this man begins to rapidly lose hair in his early twenties, it's a safe bet that he will develop extensive balding at some point. In short, it's very hard to accurately predict who will go bald and how rapidly.

This inherent uncertainty about the progression of balding is of utmost importance in planning surgical hair restoration, as we will see in later sections. We must always plan for a "worst case scenario" in order to give patients the best possible results in the long term, as well as in the short term. Anything less is irresponsible.

### Androgenic Hormones

All normal men and women produce "male" hormones. The most common of these are testosterone, androstenedione, and dihydrotestosterone (DHT). Androgens are produced by the testicles and adrenals in men, and by the ovaries and adrenal glands in women. These hormones are quite important in both sexes, but occur in different concentrations, being much more predominant in males than in females. This, in part, is responsible for the typical differences between the genders.

It is the exposure of the hair follicles to DHT, in a genetically susceptible person, over a period of time, which leads to androgenetic alopecia, or male and female pattern baldness. How does this exposure to DHT occur?

In certain cells of the hair follicle, and in the sebaceous glands, there are high levels of an enzyme called 5-alpha-reductase. What this enzyme does is to convert testosterone, which is delivered to these areas by the blood, into DHT. This is important not only in understanding the mechanisms of balding, but also one medical treatment now available: Propecia (finasteride). What Propecia does is inhibit, or limit the activity of, this 5-alpha-reductase enzyme. Therefore, there is less conversion of testosterone to DHT, and lower levels of DHT are found in the follicle. In later sections, we will discuss this and other medical treatments in much greater detail.

### Aging

There is no set age at which balding occurs. It is a *process*, and this is a simple, but oft-ignored fact. Like any process, it can be rapid or slow, it can begin toward the end of life or in the late teens, and it can progress in a predictably inexorable fashion, or it can stop and start, seemingly stabilize, and then begin again. Once we understand and accept this as a dynamic process, then we can better plan for the present and for the future in terms of how we treat it. This quest for understanding, which you have begun just by opening this book, will do more than all the despairing thoughts, hand-wringing, and self-pity, toward allowing a clear-eyed, rational, long term approach to the problem of hair loss.

So we now have looked at these three interdependent factors that play into the common types of balding. Again, they are: hormones, genetics, and Father Time. So what exactly *does* happen to the hair? Let's take a look.

Assuming we have a genetically predisposed person, then as the follicles are continuously exposed to DHT, an interesting phenomenon occurs. Remember the anagen phase, or active growth phase of the hair? This phase becomes gradually briefer and briefer, and eventually the hair becomes finer and shorter, and less deeply colored. We call this "miniaturization" of hairs. This is also the point at which hair loss tends to first be noticed. It's not that there are fewer hairs on the head, but that their caliber (cross-sectional area), color and length are so diminished that they no longer provide "coverage" for the scalp beneath. Light penetrates through to the shiny scalp, and this is perceived by the observer as "thinning" or balding.

Also, the ratio between hairs in the anagen phase and those in the telogen, or resting phase, is increased. This simply means that, at any given time, an increased number of hairs are in the telogen phase. These extra numbers of telogen hairs will be found in the susceptible zone for common balding, which is the front, top, and crown of the head. The so-called "permanent" zone, the familiar horseshoe-shaped wreath of hair around the back and sides, is unaffected by these changes. The telogen hairs are easily dislodged during

washing, drying, or combing, and this is the second sign of balding: in addition to the apparent thinning seen with miniaturization, we begin to see larger numbers of hairs on the comb, the towel, the pillowcase, or in the bathroom drain. This can be quite traumatic, especially for the younger man or for women. In the next section, we will discuss the natural history of balding, that is, the way it first presents or appears, the different ways it progresses, and how it affects the different regions of the head.

For the sake of completeness, let's briefly mention some of the other patterns of hair loss, if only to distinguish them from androgenetic alopecia (male and female pattern baldness). There is alopecia areata, where discrete patches of scalp go bald; triangular alopecia, which tend to occur in a triangular pattern in the temporal area; alopecia universalis, in which the entire body may be affected; and various "toxic" alopecias, including those following a severe illness, sometimes with high fever, or following pregnancy. Toxic alopecias may also occur with low thyroid and/or pituitary gland function, or following chemotherapy. The cicatricial (scarring) alopecias occur following tissue destruction and inflammation.

Also seen are the so-called diffuse alopecias (patterned and unpatterned), in which there is widespread thinning that may affect the "permanent" zone as well as the areas vulnerable to balding. In any or all of these less common types of balding above, it may be necessary to have a complete physical and laboratory workup, possibly including scalp biopsy. So again, the common types of balding are directly related to the presence of male hormones in a genetically predisposed person over time. This can occur in both men and women. The process involves progressive miniaturization of the terminal hairs, and diminished length of the active hair growth cycle. Now, let's take a look at how this microscopic, cellular process is manifested on the head; we can call this the natural history of balding.

## Chapter Three: The Natural History of Balding

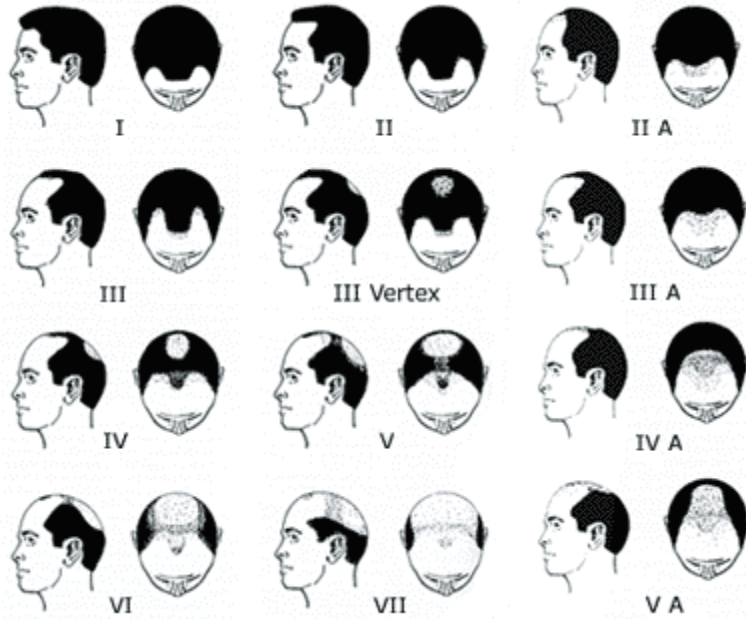
The natural history of balding is simply the way it first presents or appears, the different ways it progresses, and how it affects the different regions of the head. We consider it vital that anyone with common balding become familiar with these concepts. If you can become as conversant as possible with the different balding patterns, and can learn to compare and contrast your own hair loss with these known patterns, you will become a more informed patient. You will ask better questions, understand the answers in more depth, and be more likely to take care of the hair that you do have. Also, if you choose a medical or surgical hair restoration treatment, you will most likely have appropriate expectations, and be more apt to follow the doctor's instructions about post-operative care or taking your medications.

In the beginning, we are born with varying amounts of soft, fine baby hair, which is vellus in nature. As we grow, much of our hair becomes the more robust terminal type. It may change in pigmentation, often becoming darker, and it may acquire a curl or wave, and may become coarser.

After puberty, we see what we call the adolescent hairline. This type of hairline may only persist for a few years, and is characterized by its low, fairly flat spread across the forehead. This looks great on teenagers, but this is rarely found on mature adults, even in their twenties.

As men progress through their twenties, given that there is no balding, the hairline assumes the "mature" look, with slight frontal-temporal recessions, which impart a concave appearance to the hair line on each side, with a lower peak in the middle. This is analogous to the number "11" Classification on the Norwood scale (fig. 3). This is the most well known of several systems for classifying degrees of baldness, and was developed by Dr. O'Tar Norwood. This is a very useful scale for identifying one's own current degree of hair loss in a way that is acknowledged and understood by physicians in the field of hair loss treatment.

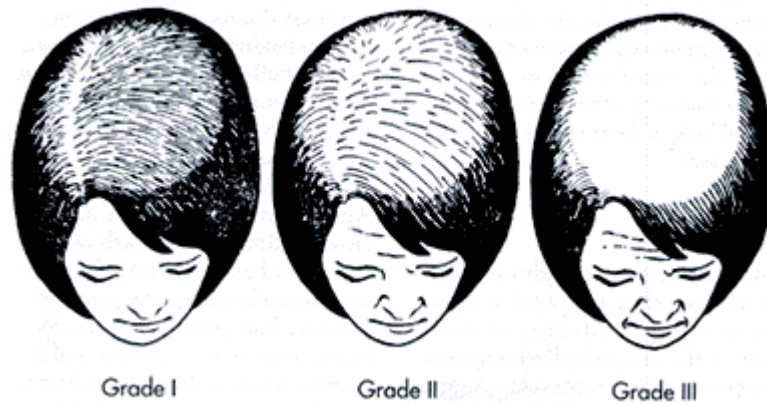
This "mature" hairline is not considered balding; the Norwood III is considered the first evidence of balding in androgenetic alopecia (male pattern baldness). In studying the Norwood charts, we see that usually the most advanced balding is known as a class VII, and that there are also Type "A" variants in which the forelock in the middle tends to recede along with the fronto-temporal areas, and in which there is less overt crown loss than in the regular III, IV, and V patterns.



**Figure 3**

So there may be front-to-back hair loss, or hair loss beginning in front and at the crown simultaneously, or sometimes isolated vertex or crown loss (the “bald spot”). These patterns are often overlapping and not as clear-cut as in the drawings on the chart, but they are an adequate and useful guide. It is important to understand that a person may be a III at age 25, but have progressed to a V or VI by age 35. Anyone considering surgical hair restoration needs to understand the unpredictable nature of the balding process; if further loss is not planned for, then what may be a nice cosmetic effect at one age can become a cosmetic nightmare ten years down the road. We will devote an entire, later section to just this kind of strategic planning.

A word about women’s hair loss: women can experience a Norwood type of hair loss pattern. More often, however, they experience a relative sparing and preservation of the frontal hairline, but have diffuse thinning on the top of the scalp. There is also a classification system for women known as the Ludwig Classification (figure 4).



**Figure 4**

Sometimes women are candidates for surgical hair restoration due to balding, and at times have lost hair due to other cosmetic procedures, like face-lifting. This hair loss is often around the hairline or ears, and can be remedied. Women may also experience “traction alopecia”, which is caused by the chronic tugging force of tight braids or pigtales. This type of loss is also amenable to transplantation.

We have attempted here to stress the relative unpredictability of “pattern” baldness. This must be reemphasized. Often, young men seek hair transplantation and have desires or illusions about how they would like to appear. These may or may not be feasible. Certainly, when one is 25, it may be hard to care about one’s appearance at 45, but this must be factored into the equation. The recent memory of the low, adolescent hairline burns brightly in the mind of a young man, but a really good hair transplant procedure should always give the patient results that can be “worn” for a lifetime, and always appear appropriate for that individual’s age and head shape. This is where the attention of an experienced, well-trained, aesthetically sensitive hair restoration surgeon makes all the difference in the world.

## Chapter Four

### Hair Systems: Yes or No?

A hair system (also known as non-surgical hair replacement, hair bonding or hair integration process) by any other name is a wig, toupee, hairpiece, appliance, weave or, to use the vernacular, a “rug”. A source of great amusement to the fully haired, and the butt of a million bad jokes, the male wearer of a wig often lives in a constant state of low level paranoia and anxiety about his public discovery and subsequent humiliation. For some men and women, however, a hair system is a viable alternative to confronting the world in a state of balding.

Women seem to have been dealt a better hand than men when it comes to wigs. Society is more accepting of females altering their appearance in general: makeup, cosmetic surgeries, Botox, hair coloring, and the use of wigs. Indeed, there is a certain glamour associated with singers and actresses changing their hair to reflect a changing personality. Be that as it may, it has been a slow process for our current culture to accept “hair systems” as an option for balding men.

Now, however, this method has permeated our common lexicon (“I’m not only the Hair Club president, I’m also a client!”). So let us discuss the wigmaker’s art, the types of systems, and the strengths and drawbacks of “borrowed hair”.

The materials used are of two main types: real hair and synthetic hair. There are currently no synthetics that rival real human hair; it simply lacks the natural texture, feel and look of real hair. Of the sources of human hair, most is Asian, but European hair is more highly prized. Asian hair tends to be more coarse, and, when dyed to match the wearer’s shade, tends to look even more so. Also, unless it is used in a full wig, there may be more difficulty matching with the person’s existing hair.

Many wigs and hairpieces are mass-produced, and these tend to be of lower quality than hand-made pieces. A few wigs are still custom made by fine artisans, with multiple fittings for the client, much like a fine tailored suit of clothes. Obviously, with such a range of quality, there is a corresponding price range, and hairpieces can be purchased costing from a few hundred dollars to five thousand or more, depending on hair type and construction. Maintenance is also an issue, and most clients choose to purchase at least two wigs, so that one can always be worn when one is returned to the maker for maintenance.

All wig construction begins with a foundation of fabric or synthetic material. Many are sewn into fine mesh-like or “lace” foundations. Others are made using polymer bases that are promoted as “like a second skin”. The quality

here also varies, as it does according to the skill with which the weaving is done. A finely crafted piece will honor the normal directionality, that is, the angles at which hair normally emerges from the scalp; this is of great importance in hair transplantation, and will be covered in detail later.

Regardless of the type of foundation used, all hairpieces, with the exception of full wigs, must be attached to the head. This is accomplished in a variety of ways, including clips, tapes and bonding agents. These all have their advantages and disadvantages, and the choice has much to do with the size and shape of the piece and the personal preference of the wearer.

Clips are the easiest for getting the piece off and on; the downside is they can cause traction alopecia from the constant pulling force on the existing hair they are clipped to. Adhesive tapes are easy, but leave sticky residue on the hairpiece that requires cleaning and may prematurely age the appliance. There are also systems that are bonded to the scalp (temporarily) using adhesives, usually applied to a polymer (type of plastic) foundation. Sometimes these systems are marketed as “non-surgical hair implantation” because the plastic has hairs imbedded into it.

Hair weaves are another method, by which the foundation fabric of a hairpiece is woven to the client’s existing hair. This affords the wearer good stability; however, as is the case with the “bonded” systems, they become loose as the underlying hair that remains grows out. Then, the client must return to the office for maintenance. This re-tightening or re-bonding must be done about every month, usually for a fee. Incidentally, many hair restoration surgeons feel that prolonged wearing of wigs and systems may accelerate the process of hair loss, probably through a variety of mechanisms.

Many men chose to use a hairpiece rather than undergoing surgical hair transplantation because of the latter’s cost. However, when we calculate a lifetime of periodic purchases of hairpieces (they do wear out!), the need to have two or more pieces available, the periodic maintenance, and, for many systems, monthly maintenance and/or re-tightening charges that may range from \$100 to over \$500, the cost obviously adds up. Hair transplantation, on the other hand, provides a permanent growth of natural hair from the patient’s own head, and this may require only one procedure for a lifetime. Some men have such advanced baldness and such limited “donor” hair, that a hairpiece is a good option. Only a consultation with a physician specializing in hair restoration can help the balding patient make a truly educated decision.

## Chapter Five

### The Psychology of Hair Loss

It really is all about loss, isn't it? Some would disagree and cry "vanity, it's all vanity!" Let's forget for a moment about hair specifically, and talk about what happens when humans sustain a loss of any kind.

Well, we grieve. How we grieve depends upon myriad factors: our personalities, racial and ethnic background, age and gender, our emotional state at the moment, the culture of the day. Whether we've lost a spouse through death or divorce, a limb from an accident, a breast because of cancer, or our financial stability via job change or economic hard times, we will all experience grief in our own way. This is not to say that all losses are equivalent; obviously they are not.

We all cope with these losses in different ways, and society as a whole grants us "permission" for a certain degree and measure of grief. After a certain, rather poorly defined period of time, we are to get over it and come to some sort of acceptance of our fate. Our acceptance may be minimal or grudging, our coping dysfunctional, but we move on.

Some people decide to not just accept their fate, but to take action, to utilize some device or procedure to ameliorate or lessen the impact of their loss. Society as a whole has prevailing attitudes regarding these choices, as do different individuals. Certainly no one would belittle the cancer patient who chooses a breast prosthesis or implant, or who wears a wig to disguise her hair loss from chemotherapy. Neither would we deride those utilizing prosthetic limbs, or even a man having a silicone device in place of a cancerous testicle that had been removed. The motives of the burn patient having reconstructive surgery to repair a ravaged face are understood by all.

Well, you may say, these are functional parts that have been lost, a bit different from the overarching vanity of hairpieces or hair transplants. Is that really always the case? The post-menopausal woman certainly doesn't "need" the breast; her breast-feeding days are long since finished. The man recovering from testicular cancer can do fine with just one, in fact, he can survive with none. The burn patient will get along just fine physically without the missing skin.

The point is this: regardless of the attitude of the culture of the moment, loss of any kind affects people in different ways. Some individuals with hair loss do fine. They may feel "bald is beautiful" and shave their heads. Actor Yul Brenner never grew out his hair after shaving it for his role in "The King and I"; his entire career became based on that "look". Others, however, feel the loss, or impending loss, of their hair acutely. They may become depressed and anxious, their self-esteem may plunge, and they may become more and more

withdrawn from the world. Their various attempts to disguise the balding may inhibit their desire to run, swim, or perform any exercise, or to be outdoors where sweating or the blowing of the wind might occur. They often begin to avoid intimate contact with others. These can constitute major negative effects on physical and psycho-emotional health. Is it then, “just vanity” to attempt to recover the loss that many experience with balding? We think not.

Men and women express many different motives for desiring hair restoration. Perhaps they wish to look as young as they feel, or they may see it as a gift to themselves for all the hard work they have done. Some see it as a step up in the business world, or they may see it as a requirement if they work in the entertainment industry. Women often strongly identify their femininity with having long, thick hair. Some people simply see their desire for attractive hair as integral to their overall sense of wellbeing. Regardless of the motives, which may be complex and multifold, the decisions need to be educated ones; often the desperate patient becomes easy game for the unprincipled wig maker or surgeon who plays on their fears and panic for immediate financial gain. This can lead to wasted money, or at worst, cosmetically tragic consequences.

## Chapter Six

### Medical Treatments for Hair Loss

For thousands of years, hopeful and desperate men have fallen prey to hucksters and salesmen hawking various potions and ointments, with claims of miraculous balding cures. The latest and greatest cures have never lived up to their hype, leaving the balding victims poorer but (sometimes) wiser. A powerful placebo effect (based on a strong desire for the treatment to work), along with gullibility or desperation, often resulted in a temporary sense of “improvement”. Eventually, however, the fact that there were no cures for baldness became evident.

Even today, we have no miracle “cures” for baldness. Even surgical hair restoration does not cure the balding process; what it does is redistribute permanent hair to balding areas. The same can be said of the two medical or drug treatments that have been shown to be of use in hair loss. Propecia, and especially Rogaine, do not so much reverse balding, but halt or slow its progression.

#### Rogaine (minoxidil)

Minoxidil has been available in oral form for years. It was originally developed as an agent for treating high blood pressure; it had a number of significant side effects, which limited its use to people with severe, refractory high blood pressure, which was not completely responsive to combinations of other medications. One of the less dangerous, but quite obvious, side effects was “hypertrichosis”, or the growth of hair on the face or other areas of the body.

Of course, someone had the bright idea that perhaps applying this drug to the bald scalp might grow hair there. Thus, Rogaine was developed by The Upjohn pharmaceutical company, and the rest is history. Again, Rogaine does not cure baldness; in fact, no one is quite sure how it works. We do know that it does not grow hair on completely bald scalp; rather, it tends to retard the loss of hair in areas that are highly miniaturized. It may be that Rogaine prolongs the growth phase of the hair (remember the anagen cycle, that gets progressively shorter in the balding process), which halts or slows the miniaturization process.

With the use of Rogaine, it may take 6 to 12 months to notice a change; in fact, some people do not notice a difference unless they stop using it. Within 2 to 3 months of discontinuing the medication, any “re-growth” or appearance of increased density will vanish. In other words, even if Rogaine works for you, you must continue the medication indefinitely, or any benefit will be lost. Also, it is effective in the crown or top of the head, but not in the frontal area. This is unfortunate, because the front of the scalp and the hairline are the most cosmetically important areas. (Please repeat after me! The utmost

importance of this primary rule of hair restoration will be reemphasized over and over as we consider treatments for balding).

Rogaine also must be used twice a day; once a day application has been clearly shown to be ineffective. In addition, the growth may not be as great as one imagines; since Rogaine probably works by increasing the thickness of hairs which are already miniaturized, the most many patients see is an apparent growth of fine, fuzzy hair which does not tend to grow very long.

Women may also benefit from the use of Rogaine, especially since their hair loss is often characterized by diffuse thinning. If this is the case, a halting or reversal of thinning may be possible with prolonged use; but as with men, stopping the medication will result in a reversal of the benefits.

Some hair restoration surgeons recommend that their transplant patients use Rogaine before and then immediately after the surgery, especially if grafts have been placed in and around existing hair. The medication may help prevent the temporary loss of healthy, preexisting hair due to the shock of the procedure. Some surgeons do feel that the medication should be stopped a week prior to the surgery, because it dilates blood vessels, and might increase operative bleeding.

### Propecia (finasteride)

The drug finasteride (marketed as Proscar for symptoms of prostate enlargement) has been available for years. Only since 1998 has it been approved for use in male pattern balding, and has been formulated as an oral, one milligram tablet called Propecia (versus the five milligram Proscar).

This drug works by inhibiting the action of the enzyme 5-alpha-reductase, which, as you remember, is the enzyme responsible for converting testosterone to dihydrotestosterone (DHT). Men with pattern balding have higher levels of this enzyme in and around the follicles that are at risk for loss. It is the effect of DHT on the hair follicles that leads to the miniaturization of terminal hairs. So, if we inhibit 5-alpha-reductase, then we inhibit DHT formation, decrease its levels in the blood stream and in the scalp, and stop or slow the process of miniaturization that we know as balding. Indeed, this is what was found in the clinical studies on Propecia.

A word about hormone effects: DHT is responsible for facial hair growth, increased incidence of acne, growth of the prostate gland, and is integral in the development of male pattern baldness (androgenetic alopecia). Testosterone, on the other hand, is the classic "male" hormone, and is responsible for the changes seen at puberty: lowering of the voice, growth of the genitalia, an increase in muscle mass, and increased libido or sex drive. When testosterone is deficient, there may be decreased sex drive, erectile

dysfunction, depression, lack of normal “drive” and ambition, and a loss of muscle mass. In other words, most of what DHT effects, we can do without! Testosterone, on the other hand, is extremely important. When men took the one milligram dose of Propecia, their DHT levels dropped by about two-thirds; on the other hand, testosterone levels were not only maintained in the normal range, but increased almost ten percent!

So the mechanism by which Propecia acts, unlike that of Rogaine, is well understood. Let’s look at what the studies and clinical trials showed about its effectiveness. 1,553 men, ages 18 to 41, with Norwood Class II Vertex, III Vertex, IV or V balding patterns (which are mild to moderate; the Class VI and VII are the most severe patterns) were given Propecia. At two years, 83% of those taking Propecia either grew more hair or at least lost no more. However, this effect was much more noticeable in the crown area than in the frontal or hairline zone. Also, the hairs that did grow in were longer and thicker, or more like terminal hairs, in contrast to the finer, shorter hair seen with the use of Rogaine.

Side effects seen were minimal in number. They included different types of sexual dysfunction (decreased sex drive, erectile dysfunction, decreased semen volume) at a total incidence of 3.8%. However, the group that received the placebo (sugar pill) had an incidence of 2.1%, which is not a large difference at all. Furthermore, these sexual side effects went away in all the men who stopped the medication, and in almost two-thirds of those who continued the medication!

6 to 12 months are required before any increase in hair is apparent; any sexual side effects would have occurred well before that time, so there is not a problem of losing hair that was gained on the medication when one stops taking it. Also, remember that if a person stops either Propecia or Rogaine, any hair lost will be only that which was gained or maintained while on the drug, and not any other; in short, one returns to the state of balding one would have experienced had one never taken the drug at all.

Another interesting finding in patients on Propecia is that it causes an approximately one-third reduction in the level of prostate-specific antigen (PSA). PSA is used as a screening test for prostate cancer; it also may be elevated in men with enlargement of the prostate. There has been some concern that this might compromise prostate cancer screening, even though the decrease in PSA is fairly predictable. To be safe, however, men should let their primary physician know if they are taking Propecia, so that this blunting effect on PSA can be taken into account.

Propecia does not seem to grow hair in areas that are completely bald. Its effects are apparent only in areas of the scalp that are thinning, but where there is still some hair present. Therefore, the major benefit of the drug

seems to be in its ability to slow down or halt hair loss, or regrow hair in parts of the scalp that are miniaturized. The long-term ability of Propecia to maintain one's hair is unknown. Effects usually peak around one year and then are stable in the second year or decrease very slightly.

As previously stated, the benefits will stop if the medication is discontinued. Over the 3-6 months following discontinuation of Propecia, the hair loss pattern will generally return its native state (that is, as if no medication had ever been used).

Although both Propecia and Rogaine are FDA approved as being safe and effective, this does not mean that all the long term effects are known. Even though the side effects are rare, we can see that the drugs' actions are not entirely confined to the scalp. We now have three to four years of experience with Propecia; only over time will the full ramifications of either of these agents be fully evident.

Many hair transplant surgeons find Propecia to be an excellent adjunctive medication, for several reasons: 1) Propecia works best in younger men; some of them may not be hair transplant candidates yet. 2) the medication works better in the crown area, and often the crown requires more surgically harvested donor hair than may be available. 3) Propecia is less effective in the front. Hair transplantation has its greatest impact on the hairline and in the frontal area. 4) If Propecia continues to slow or halt hair loss in the crown area, surgeons may be able to create greater density in areas such as the front, which will have a greater cosmetic effect, while sparing the all-important donor hair for the future.

While not an actual hair growth or maintenance product, there is a newer post-operative product that we will mention, known as GraftCyte, which is manufactured by the ProCyte Corporation. This line of products contains copper peptides, which have been shown to help with wound healing. The company makes a shampoo and conditioner, that are often recommended after transplant surgery, as well as a spray for hydrating the graft sites, and prepared, foil-wrapped sets of copper peptide saturated gauzes designed to be used for the first three post-operative days. In addition, there is a gel to be placed on the donor incision in the back of the head. All of these interventions may lead to improved, more rapid healing.

There are also claims that using the GraftCyte products promotes the more rapid growth of the transplanted hair. This has yet to be proven in controlled trials, but many people chose to use these products for their healing properties, and hope that these unproven claims are true as well.

# Chapter Seven

## Surgical Treatments for Hair Loss

### History of Hair Loss Surgery

As early as the 1930's, Japanese physicians were successfully harvesting and grafting multiple and single hairs into other areas of the body, including the scalp, face, and pubic region. The reports of these procedures were written in Japanese; this, together with the onset of World War Two, insured that the Western world remained in the dark until the late 1950's.

In 1959, New York dermatologist Norman Orentreich reported hair-bearing scalp autografts (from the same person) that were successfully transplanted from the back of the head to the balding front and top. Thus the concept of "donor dominance" was introduced, and the discipline of hair restoration surgery in the West was born.

Donor dominance is the central functional principle of hair transplant surgery. What this means is this: if one harvests hair follicles from the "permanent zone" of the scalp, and transplants it to the balding areas, the donor hair characteristics will predominate. In other words, since this donor hair is genetically programmed not to respond to the male hormone DHT by becoming miniaturized, it will continue to grow and thrive even though its location is now in a balding "zone".

### Evolving Aesthetics of Hair Transplantation

For the first 20 to 25 years of hair transplantation, 3-4mm (millimeter) round, "plug" grafts were the standard units generally placed in balding areas. These were felt to be the optimal size grafts in terms of density (hairs per square mm) and in terms of blood flow (nourishment) to the tissues of the graft. In other words, these grafts, with 12 to 20 hairs each, could achieve high density in the recipient (balding) area; also, bigger grafts would be easier to move, but re-establishing their blood flow, especially toward the center of the grafts, would be tricky. Later, this was found to be a problem even with these standard grafts, and sometimes the hairs in the very center of the graft would die, leading to the appearance of a hole in the middle, hence the term "donutting".

Other cosmetic problems were soon recognized. Often, a raised area at the base of the graft led to the aptly named "cobblestoning" effect. Probably the most widely recognized negative effect is the so-called "doll's hair" "toothbrush" or "cornrow" appearance. This results from a dense, round graft set in the midst of bald scalp; the effect is worsened by the fact that, as the graft heals in place, scarring causes it to contract. This increases the density (compresses the hairs into a bundle) even more, to a level not found



and variable entity; it is not abrupt, extremely dense, or regular. Usually, the first row or two of the hairline are single hairs, a “transition zone” between the hairless forehead and the hair-covered scalp. Also, the line is not straight at all, but irregular. Placing these small grafts at the hairline, in front of the larger, round grafts, gave a more pleasing, natural look, especially with the hair swept back or diagonally to the side.

Despite this and other benefits of using mini- and micro-grafting techniques, there was still a major downside (and still is today, as some hair transplant surgeons stubbornly cling to the old but familiar ways). Minigrafts can still produce the artificially high, local density leading to the doll’s hair look; they have a tendency to appear “pluggy”. Also, grafting large areas with micrografts often can give a “see-through” or excessively thinned look. The reason for this is quite important to understand; although a 2 hair follicular unit and a 2 hair micrograft contain the same number of hairs, the devil is in the details; the major detail is in the way they are cut. Follicular units are dissected out intact, using a microscope, and thus have the minimal amount of tissue present to support the hairs. Conversely, micrografts are cut without regard for the follicular unit structure; a 2 or a 3 hair micrograft may contain hairs from as many as 2 or 3 separate follicular units! As such, they contain much more tissue than corresponding follicular units, require larger recipient incisions, or even holes, and cannot be placed as closely together. Healing takes longer with these excess tissue-containing grafts, and their larger incisions, and it may be that breaking up the fundamental unit of hair growth inhibits the very survival of the grafts themselves.

### Scalp Flaps

Plastic surgeons have developed methods of advancing hair-bearing “flaps” of tissue from one area of the scalp to another. For example, a strip of scalp from the non-bald temple might be freed up, and rotated forward to the bald frontal hairline. A small area of the flap is left attached in order to preserve the blood supply of the tissue. Unfortunately, sometimes the blood circulation is compromised, leading to tissue necrosis, or death of part of the flap. This can cause visible scarring, as well as loss of the hair (!) from that portion of the flap.

The benefit of flap procedures is that one has an instant “growth” of mature, full-length hair in the previously bald area. There is nothing subtle or gradual here! This may be a social liability if one desires privacy regarding the surgery.

This is major surgery, requiring a hospital operating room. Bleeding and infection are other possible complications. Also, there is a cosmetic downside. A hairline constructed with a flap is likely to be unnaturally straight and overly dense, unlike the natural “feathered” transition zone found in a natural or

surgically well-constructed hairline. The inevitable scar at the leading edge of the flap may also be apparent to the observer. Also, there may be thinning or balding scalp behind the flap, which requires camouflage. Alterations from the normal direction of hair growth can appear nothing short of bizarre. Thus we see little benefit and abundant potential for negative outcomes with flap procedures.

### Scalp Reductions

These procedures are collectively known as alopecia reductions, baldness reductions, male pattern reductions, and by other names. The basic premise is, that by excising, or cutting out, a segment of bald scalp, the baldness is reduced. This provides an immediate and relatively dramatic improvement in the balding appearance, and the added benefit of less area needing to be grafted. This would limit the strain on the patient's finite "donor reserves", meaning the hair available from the permanent zone that can be harvested for grafting. This may seem intuitively obvious at first glance, but consider this: when scalp is removed from the crown area and the top of the head, the sides and back are pulled up in order to approximate the wound and suture it closed. The effect this can have on the donor hair in the back and sides of the head is to decrease the density of this hair.

Other problems that slowly became evident included the phenomenon of stretchback, whereby the natural elastic properties of the scalp skin overcame the tension element of the scalp reduction, and some or all of the benefit would be lost. Hair loss may be accelerated by scalp reductions, in the opinion of some hair surgeons; we definitely know that "shock loss", or effluvium, can occur around the incision. Some of this shock loss hair may or may not grow back, largely depending on its state of miniaturization.

Scarring is one of the most significant complications seen after scalp reduction. There are a number of incisional patterns that surgeons use: the midline ellipse, Mercedes star, Z-plasty, and lazy-S. The end result of any of these will be a scar in the shape of the sutured wound. This scar may be more or less noticeable depending, in part, on whether there is continued balding in the area, or how closely adjacent to the scar dense hair is found. The fact of the matter is that the patient's donor density and scalp laxity can be reduced by the procedure. These are two of the determinants of the amount of donor "reserves" remaining. If they are reduced enough, there may not be enough hair left to graft over the scar if it is, or becomes, obvious to the casual observer. This is a major cosmetic problem.

While scalp reductions are often done as series of two or three, some surgeons will substitute for the series by doing one large procedure. This is known as a scalp lift or hair lift. It requires general anesthesia, and essentially undermines the scalp down to the ears and down to the neck. Then, the loose

scalp is pulled up, the balding area removed and the wound edges stitched together. It is also standard procedure to ligate, or tie off, the major arteries to the back of the head, called the occipital arteries. Usually, the occipital nerves are sacrificed in the bargain, leading to significant and long lasting scalp numbness.

There are also various types of scalp expanders, both inflatable and spring-type. Both types are surgically implanted, and are designed to stretch the scalp prior to the reduction surgery. Their effects are variable, and although some surgeons seem to do well with their use, many of the same potential drawbacks of scalp reductions may occur.

Two other well-known cosmetic deformities resulting merit mention here. One is the loss of normal hair direction, often manifesting as the “parting of the Red Sea” phenomenon. This occurs because when the scalp is pulled up from the sides, and then becomes situated on top of the head, its hair will still emerge at its native angle. In short, it may appear to stick out to the sides from the midline in an unnatural way, like the biblical parting of the Red Sea. Another is the “posterior slot” formation, which also occurs as the result of scalp reduction surgeries. This “slot” appears as vertical scar running down the crown of the head, with the adjacent hair angled out flatly. This is a very obvious deformity; there is a flap surgery designed just to correct this problem (!), but it is complex and not performed well by many surgeons.

We feel that scalp reduction procedures generally have a very high risk to benefit ratio. As such, we would rarely recommend these surgeries, except in certain selected patients with the ideal hair and scalp characteristics, of the optimal age, and who are highly motivated. With all other factors considered, properly performed follicular unit transplantation (FUT) can produce natural, undetectable results, without cosmetic deformity, in patients who are candidates for this procedure. In the next section, we will discuss, at length, FUT, why and how it is done, the rationale for, and history of, its development, and its potential drawbacks.

## Chapter Eight

### Follicular Unit Transplantation: the State of the Art

#### Following the Example of Nature

Only in the early 1980's was it been recognized that hair grows not singly, but in specific anatomic units that are called follicular units (FU's) (see figure 1). These consist of one, two, three, four, or rarely five terminal (mature) hairs, one or two vellus (fine) hairs, a discrete nerve and blood vessel supply, a connective tissue sheath, sebaceous glands, and a tiny muscle known as the erector pili. These FU's are the natural groupings of the hair, the way it normally grows. It seems intuitively obvious that a natural transplant would follow the form of nature and use strictly FU's. This has, unfortunately, not been the case.



**Figure 5**

It would be expected that using this method would allow us to create the most undetectable result, and also allow us ease in following the natural angles of emergence from the scalp. These angles at which the hairs exit the skin are quite important, as they vary widely depending upon the area of the scalp we are observing.

Also, improved survival may result from this technique. Consider the old, large plug techniques. The recipient site was actually created using the same type punch that was used to harvest the graft. In other words, tissue was removed. This not only created the potential for scarring and "cobblestoning", it could compromise the blood flow beneath the scalp as well. In addition, the size of the grafts themselves could limit the flow of blood and oxygen to the

hairs in the center of the graft, leading to “donutting”. On the other hand, using FU’s requires only a tiny recipient site in the scalp; we often use only a hypodermic needle to make these miniscule slits! Thus, healing is much quicker, there is less post-operative evidence of the procedure (even the next day), and there is minimal excess tissue subject to scarring and other complications.

### Minimizing Donor Hair Wastage: Mathematical Planning

Research has shown us that for Asians and Caucasians, the density of follicular units, regardless of the number of hairs they contain, is about one per square millimeter (1FU/mm<sup>2</sup>). For African type hair it is less, approximately 0.6FU/mm<sup>2</sup>, although this is more than made up for by the preponderance of three hair FU’s, versus two hair FU’s in Asians and Caucasians.

We can directly measure not only the FU density, but the hair density as well, by using a tool called a densitometer. With small areas of hair clipped short, a fixed area is observed under bright light and magnification. Then, we can calculate the appropriate numbers, for example: we can look at the density of FU’s and hair in the center of the back of the head, over the ear, and halfway in between. If the numbers average 1FU/mm<sup>2</sup>, and 2 hairs/FU, and the patient will be receiving 1500 grafts, then we can calculate that we will need to harvest about 15 square centimeters (cm<sup>2</sup>) from the back and side of the head to give us our required grafts. We can also assume that, given a 20% occurrence of single hair grafts in those with average density, our 20cm<sup>2</sup> donor strip will provide us with about 300 single hair grafts, which should be enough for our hairline transition zone.

Moreover, we can use calculations to plan for the future. The average, non-balding person has about 100,000 hairs on the scalp. This would translate to 50,000 follicular units (FU’s). The “permanent zone” comprises about 25% of the total scalp; therefore, there would be one-fourth, or 25% of these total 50,000 FU’s in the permanent zone, which would equal 12,500 FU’s. We know that about half of the hairs in an area must be lost before there is any appearance of balding, so we could safely harvest up to half of the permanent zone FU’s, or 6,250 FU’s. This gives us an idea of the viable, reasonable donor reserves that a given patient has for current and future transplantation.

It is important to realize that the amount of coverage and density that a given person achieves with FU transplantation will vary not only according to their donor density and scalp laxity, but also according to their hair characteristics. This is another point where art meets science in the field of hair transplant surgery.

## Hair Characteristics in Follicular Unit Transplantation

The characteristics that are most cosmetically important are: hair color (especially relative to the underlying skin color), hair curl (or lack thereof), and hair caliber, or cross-sectional area (in other words, is the hair shaft itself fine, or coarse). The artful hair restoration surgeon will take all these factors into consideration when planning a procedure, in order to give the greatest aesthetic benefit to the patient, with the minimal use of the limited donor hair.

Hair caliber, or cross-sectional area is actually more significant than density in its ability to “cover” bald scalp. Remember that the appearance of baldness is actually due to light penetrating past sparse or absent hair, and then being reflected off the shiny scalp. The more hair that is in place to block the light, the less the appearance of baldness will be. It can be mathematically shown that doubling the caliber of hair would do more to block light than doubling the density. However, there are other important factors.

One of these is the degree of curl. Generally speaking, the more curl or wave the hair possesses, the more coverage it will grant the scalp. An excellent example of this phenomenon is found in African-type hair. This hair tends to be tightly wound or kinky, which may be an evolutionary adaptation to protect the scalp in hot climates. Although African follicular unit density tends to be lower than that of Caucasians or Asians, ( $0.6 \text{ FU/mm}^2$  vs.  $1 \text{ FU/mm}^2$ ), the curl characteristics lend this type of hair wonderful coverage properties, as it tends to stand thick and mat-like above the scalp, thus blocking much light. Also, an added advantage is that African hair tends to occur predominantly as three hair units, rather than the two hair units characteristic of Caucasians/Asians with average density.

Hair color, especially as it relates to underlying skin color, is also of great importance. The less contrast there is between hair and scalp, the better the potential for coverage. A blond person with light skin, like someone of Scandinavian origin, appears bald only after significant hair loss has occurred. This is because the observing eye sees a high contrast as standing out in stark relief, and areas of low contrast blend together. So even though many Asians have good density and excellent hair caliber (coarseness), they may be challenging hair transplants. Imagine dark, straight, coarse Asian hair contrasted against relatively light scalp skin; the eye notes the contrast, and sees the light that has been transmitted. The eye follows the straight hair shaft right down to the scalp, and it appears balder than in someone with more favorable hair characteristics.

We can see, therefore, that a combination of many factors play a part in determining who will be a poor, good or excellent candidate for hair transplant surgery with follicular units. High density is great, but unfavorable hair characteristics may attenuate some of the benefits of this density. On the

other hand, someone with curly, coarse, salt-and-pepper hair (very good characteristics), but with poor donor density and a tight scalp, may also not be the ideal candidate. This is where the artistic, knowledgeable hair restoration surgeon really shines: knowing how to work with the positive resources the patient does have, to insure the best possible outcome for the present and the future.

### The Recipient Incisions

It is without question that, of all current graft types, follicular units can be placed into the smallest incisions; consequently, they can be placed in closer proximity in the scalp. Although it is not necessary to come close to the patient's original density when transplanting, there is a certain minimum required to obtain coverage; also, the hairline especially needs closely, although somewhat randomly, placed single hair grafts to give the illusion of graded density.

Small incisions, moreover, simply heal more quickly than larger ones, and the grafts placed are less likely to suffer from blood-flow and oxygen deprivation. Any incision can damage the circulation of the scalp, cause scarring, and effect wound healing, hair growth, and even the potential for subsequent transplantation. In addition, small recipient sites, made with needles or micro blades, conserve the normal matrix structure of the scalp's connective tissue. This allows the FU's to fit snugly within the created sites, avoiding dislodgement, and promoting quicker healing and immediate nourishment of the grafts from local blood supply. We discussed earlier the slow and repetitive process of using large, standard grafts; only so many could be placed at one time. With follicular unit transplantation, however, sessions placing as many as 2000 to 3000 grafts at once, and more, have become routine for us. For many patients, this may be the only procedure they ever need!

### Large Sessions: The Rationale

Let's talk for a moment about large sessions. As it has become apparent that excellent growth can be realized with large FU sessions, other benefits have become manifest. For one thing, it advances the hair restoration process expediently. Most patients have no desire to get ensnared in a lengthy, repetitive series of treatments that they might even have to terminate prior to completion. A large session of FU's, in some patients, can create a natural, undetectable result; this transplant can stand on its own, and continue to look natural even in the face of further hair loss, and without the necessary need for further work. In short, the process is just plain expedient and efficient.

Also, every time a procedure is done, the donor area is "violated". One large, single strip harvested from the donor area will, by definition, create

significantly less scarring, hair loss, and distortion of remaining hairs than will multiple, small strips, or, even worse, punch grafts. Minimizing the number of harvests, careful suturing and closure of the donor site, and close attention to harvesting technique can be invaluable in preserving precious donor resources; this is important not only in the event that further transplantation is desired, but also in preserving the cosmetic integrity of the donor area. We will discuss the often forgotten and underappreciated donor area at length in a subsequent section.

The possibility of telogen effluvium must also be considered with any hair restoration surgery. This is a rapid loss of hair that occurs in the area of the surgery, among hairs that are in the telogen, or resting stage. These hairs will generally grow back, unless they are severely miniaturized hairs that would be naturally lost within a short time anyway. Since it is not uncommon to be placing incisions and FU's between and around miniaturized hairs like these, there can be significant loss. If large numbers of FU's are placed during a session, then at least the patient can know that the hairs that will grow in a few months later will be strong, solid terminal hairs, and will compensate for the effluvium loss.

One other rationale for large sessions considers the need for different types of FU's (i.e., singles, doubles, etc.). As we pointed out in the section on mathematical planning, only a certain percentage of FU's will be single hair FU's. This is quite important in planning the hairline reconstruction, which required relatively high numbers of singles. If too few FU's are harvested, then the number of singles, for example, might fall short. In this case, the only options are an incomplete hairline, or "creating" singles by dividing 2 or 3 hair FU's, which is definitely less than an ideal technique. Indeed, if we claim the primacy of the follicular unit, how can we then rationalize breaking them up?

### Insuring the Integrity of Follicular Units

Let's consider for a moment the other techniques that we think are integral to the follicular unit transplantation process. One is single strip harvesting, and the other is stereo-microscopic dissection. Without these companion techniques, the procedure may be called follicular unit transplantation, but it is a pale, inefficient imitation.

As its name implies, single strip harvesting is the method by which a single strip of hair-bearing scalp is carefully, indeed, painstakingly, excised from the donor area; the strip is then broken down into its smallest functional units, or follicular units. Before single strip harvesting came to the fore in recent years, older, infinitely more wasteful methods were employed. The first of these was the circular, punch grafts of yore, which have little to recommend them save their simplicity (they are essentially biopsy punches), and the ease with which they were directly placed into correspondingly circular holes in the recipient

area. Next, ingenious surgeons devised multi-bladed scalpels; three or more (sometimes many more) blades, attached to a handle, were oriented parallel to one another, and many thin, narrow, long strips could be excised with one pass of the scalpel. These strips could then be placed flat on their sides and sliced into small mini- and micro-grafts, with little or no concern for follicular unit integrity. This, however, was not the only drawback; transaction rates were generally rather high, and were even higher when more blades were used. So time was saved, but lots of valuable follicles were wasted.

What we know as single strip harvesting overcomes many of these disadvantages. Using two passes with a single blade, or a single pass with a double-bladed knife, an elongated strip is excised. It is possible, with careful technique, to achieve transaction rates of less than 2% (this means that fewer than two FU's per 100 are sliced in two). It is estimated that transaction rates as high as 30% occur with the use of multi-bladed scalpels. Let's do the math. If the patient needs 1000 grafts, then an area containing 1300 grafts would need to be removed just to account for wastage and still produce 1000 intact FU's. If 2000 grafts were needed, 600 would need to be wasted! This is of serious import when we deal with a limited, finite amount of donor hair.

This leads us to a discussion of graft dissection. One of the reasons many surgeons have used multiple strip harvesting with multi-bladed scalpels, is that an intact, single strip presents a number of difficulties in dissection. It is too thick to place on its side or to shine light through (transilluminate) in order to visualize the individual FU's. Therefore, thin, multiple strips lend themselves to rapid, albeit inefficient, slicing of grafts. We feel, however, that the degree of wastage is unacceptably high, both during the strip harvest, and during graft preparation.

To avoid these problems, the techniques of stereo-microscopic "slivering" and dissection are utilized. As soon as the donor strip is harvested, the slivering process begins. This is extremely painstaking; the strip is divided into small "slivers", each one FU wide. These are then laid flat on their sides, and, also under the microscope, the individual FU's are carefully sliced out and trimmed of excess connective tissue and fat. During this process, the grafts are suspended in a physiologic saline solution and kept chilled; this insures their viability and health while they are "out of body". They are separated into one, two, three and four hair FU's, ***according to their natural occurrence***, and then carefully placed into the recipient sites.

We feel strongly that follicular unit transplantation is the state of the art in hair restoration surgery. Older techniques are easier and more lucrative for the surgeon, require a smaller operative team, and may be easier to "sell" with the false promise of higher density. Follicular unit transplantation, done with single strip harvesting and stereo-microscopic slivering and dissection, requires patience, a large team, and meticulous work by the surgeon and

assistants. Despite these demanding criteria, we are committed to using and refining this technique; in one or two sessions, patients can achieve results that are natural, undetectable, and will stand the dual tests of time and of advancing baldness.

## Chapter Nine

### The Donor Area: Out of Sight, Out of Mind

Having discussed follicular unit transplantation, hair density and characteristics, and some of the older techniques of hair restoration surgery, let's now lend our full attention to the donor area. This is often minimally considered, by patients and by surgeons, as it is covered by hair, and seldom seen by the patient or, hopefully, by anyone else. It is, however, of utmost importance for achieving the highest level of cosmetic excellence; respecting and protecting the donor reserves is vital in planning for future hair loss and possible future procedures.

#### Donor Area Location

If you have ever seen a man with Class VII balding, and we all have, you have seen a graphic representation of the limits and confines of the donor area. This is the hair zone that is considered permanent. With rare exceptions, this rim of hair remains even in the most advanced cases of male pattern baldness. The boundaries of this zone extend from in front of the ears, around the temples, and to the back of the head (figure 1). The hair at the temples may recede back toward the ear, and the balding area of the crown may dip quite low into the occipital area, at the back of the head. We must always assume that any man considering hair transplant surgery will eventually advance to this Class VII level for balding; it's easy to understand why. Visible scars may be revealed if the baldness advances, and donor tissue has been taken too high, too low, or too far in front of the ears.

Hippocratic wreath



## Scarring in the Donor Zone

Another problem involving scarring in the donor area is that of the widened scar. In a patient without a systemic disease or drug use that retards healing, a well-closed, non-infected incision should eventually appear as a thin white line, well camouflaged by the hair. Sometimes, however, this is not the case. For example, if the donor strip is taken too low in the back of the head (toward the top of the neck), a widened scar can result. Often, as men get older, the inferior hairline (at the neck) will move higher. If this is the case, a low, widened, visible scar can be a cosmetic liability.

In addition, certain patients with an inborn weakness of collagen or defects in the building of new collagen (collagen is the connective tissue protein of which ligaments, tendons and scars are made) may develop wider than normal scars regardless of how well the incision is closed. Surgical wisdom has always taught us that closure of any wound under tension (such as a wide incision or in taut tissues) can lead to a widened scar. Therefore, we always attempt to make the donor strip as narrow as we can, based on the tightness or laxity of the patient's scalp. Indeed, this is one of the problems seen after scalp reductions and/or multiple transplant procedures: a tight, unyielding, fibrotic donor area. This is why hair restoration surgeons like to see patients with lax, loose scalps. Occasionally, though, a paradox exists. This is when patients who do have scalp laxity heal with widened scars. It is possible that these patients may have one of the aforementioned collagen defects. In short, careful evaluation and planning can result in fine, cosmetic scars in most cases; there are cases where the scar is sub-optimal regardless of the surgeon's skill.

Many of us today see the results of older methods of donor harvesting; often, patients with the older, "pluggy" look of the past seek transplantation to remove or disguise the old round grafts, or their balding may have progressed to the point that they desire grafting to newly bald areas. When the outmoded harvesting techniques of punch grafting with open donor healing were used, the result was a "shotgun" or "moth-eaten" appearance that is cosmetically quite displeasing. This type of scarring also renders further strip harvesting difficult, to say the least, and it greatly complicates the estimation of needed strip size for a given number of grafts. Similar problems arise when the patient's donor area has been subjected to multiple small strip harvests, with a "stairstep" pattern of linear scars, or extensive plug harvesting that was then sutured in a "semi-sawtooth" pattern.

We have spoken in previous sections about the necessity of preserving the donor area for possible future transplant work. Even if an individual is older, has seemingly "stable" baldness, and is satisfied with his hair transplant outcome, the day may arise when his hair loss accelerates. Then, if his donor

area has been conserved, he may have sufficient reserves for additional procedures. If not, then his options are limited to camouflage, hairpieces, or living with the appearance of baldness.

We also discussed single strip harvesting as the technique with the most "hair-conserving" potential, and we deemed large sessions of follicular units as probably the most expedient and efficient method of transplantation. If these techniques are properly utilized, then the fewest hairs will be damaged at the time of harvesting. Furthermore, the integrity of the donor area will be preserved, scarring will be minimized, and preservation of donor reserves will be maximized for possible use in the future. This is an integral part of the essential long term planning process that will be discussed at length in a later section.

# Chapter Ten

## The All-Important Hairline: Our Facial Frame

### The Importance of the Hairline

The frontal hairline is singularly the most important feature of the entire head of hair. It is the aspect of our hair/skin interface that we, and others, see first. When we look in a mirror, or walk into a room, when someone sees us and makes eye contact for the first time, the hairline stands out. On a subconscious level, beyond the rational, it speaks volumes about our age, attractiveness, suitability as a mate, even about our health and vitality.

Why is the hairline of such significance? It frames the face. This simple statement belies the artistic and cosmetic impact of this all-important frontal zone. One of the reasons that many men with frontal balding instinctively go for the “comb-over” effect, is that it creates a hairline of sorts; it frames the face at the top and at the temples. The problem is that it is so patently obvious to everyone else as an attempt to disguise the balding.

Framing of the face is an artistic metaphor. Imagine a painting without a frame. It may be a pleasing image, but it is incomplete. Add a nice, tasteful frame and voila! You have a complete, aesthetically appropriate presentation. Similarly, frontal hairline balding takes away the frame; restoring the hairline restores the frame. The resulting appearance is one of youth, vigor and vitality.

### Planning the Hairline

Often, hairline planning is a compromise between the patient and the surgeon. This does not imply that the patient does not know what is best for him, or that the physician is wiser. What it does imply is that people have a tendency to want the hairline too high or too low. The low, rounded adolescent hairline will look inappropriate on a 40 year-old man. In fact, it may lend a caveman or “Neanderthal” appearance to his visage. Young men in their early twenties may require repeated explanation of the reasons for not creating an adolescent hairline for them. They still remember quite vividly (unlike the middle-aged man) their own, low hairline at the age of sixteen. Often, they are rather distraught about their loss of hair, and do not identify with their future selves at thirty, forty, or fifty. This is where the ethical hair restoration surgeon must explain and counsel for the patient’s benefit, rather than playing on fears and illusions in order to make a quick profit.

Conversely, a middle-aged man seeking hair restoration surgery may fear that a hairline that is not adequately receded at the temples may seem unsuitable for his age. The fact of the matter is, that a hairline placed too high accentuates the balding, by focusing attention on the wide, high expanse of

the forehead and frontal area. This concept may be easy enough to visualize if properly explained.

At any rate, if one must err slightly to the extreme, it is always better to start slightly too high, than with a hairline that is too low. One can always, in a second session, bring the hairline down by artfully adding follicular units in front of the existing border. Still, it is much more desirable to get the hairline right on the first try. After all, the primary goal of almost all first hair transplant sessions is to re-establish the hairline and frontal region, in order to frame the face. This facial framework achieves the most dramatic cosmetic and visual effect of hair restoration surgery.

### Hairline Repair or Revision

Repair or revision of the poorly done hairline is one of the most rewarding facets of the hair surgeon's art, and often one of the most challenging. The border may be overly regular, with a symmetry that defies nature; conversely, it may be so disordered and asymmetrical as to be unnatural. Again, it may appear tufted, revealing the so-called doll's hair effect. It might be too high, or more likely too low. Sometimes, the hairline is so overly rounded across the forehead as to be "bowl-like" in nature.

All of these deficiencies can be corrected to some extent. The most difficult to correct is the low hairline. Even if the grafts are large ones, and can be cut out and dissected into follicular units (FU's) for use elsewhere, scarring will result. This can be partially treated with dermabrasion and possibly lasers, but unless hair from further back can be styled forward to cover them, the scars will be detectable to some degree. We see here a graphic example of the necessity for good, rational, artistic planning when dealing with the hairline. Again, get it right the first time!

The unnaturally straight or regular frontal border may be revised with the careful, selected placement of follicular grafts in front of, and among, the existing grafts; also, large grafts within and behind the hairline may be excised and re-used if necessary, with the hair around them acting as scar camouflage. "Softening" of the hairline is accomplished with the judicious use of single hair FU's, in a more random pattern, which is harder than it sounds. Humans have a tendency when performing repetitive tasks, (such as making recipient incisions), to fall into a pattern of some regularity. It requires skill and effort to defeat this tendency and to achieve "randomness"; it's not truly random, however, but more a "controlled disorder".

There are several possible remedies for an overly rounded hairline. One can blunt the fronto-temporal angles at the sides of the head to apply a more graceful curve to the margin. Alternately, a "widow's peak" may be

constructed at the middle of the forehead, which will soften and break up the arc of the frontal border.

In the event the hairline has temporal recessions that are inordinately deep for the patient's ethnic or racial background, then these concavities may be moderated by adding FU's; this will render the margin "flatter". Finally, a repair session can be exploited to increase the density of the frontal area, if adequate donor reserves exist. This technique can also be employed to fill in around mini-grafts that look "tufted", or just to augment the density after an initial, successful follicular unit transplant.

To reiterate, the frontal hairline is the most important area to be considered in most men with pattern baldness. Reestablishing the hairline has a great cosmetic impact, regardless of the degree of balding, and should generally be the goal of the first session of follicular unit transplantation. It must be remembered that reconstruction of the frontal area will have a profound aesthetic impact on the balding person, even if there is a limited store of donor hair.

# Chapter Eleven

## The Crown: Important or Not?

### Location of the Crown

The location of the crown is actually a point of controversy. The area at the back of the head is rather ill defined in the first place; some people refer to it as the crown, some as the vertex. Others refer to the vertex as the highest point on the head. For purposes of this discussion, we will call the crown the area behind the highest point on the head; in others words, the area behind which the horizontal plane of the top of the head abruptly changes to a sloping, more vertical plane. In many people, it is a rather flattened region roughly the size of the palm of the hand. Obviously, from looking at Class VI and VII balding, we can see that the crown has the potential of becoming even larger with extensive balding. In short, the boundaries are vague when there is abundant hair in place, but the crown may become the largest bald area on the head with extreme hair loss.

### Characteristics of the Crown

In addition to its expansive size, there are other interesting aspects of the region we call the crown. Hair growth at the center of the crown is centrifugal; that is, the hair emerges from the scalp acutely and spirals in an outward direction. Sometimes there is a cowlick at the center of the spiral, which is more obvious in straight, coarse hair. Occasionally, there is a double spiral, which really makes things “interesting” for the hair transplant surgeon.

The presence of this swirl makes more sense when we examine the direction of growth of hair in other parts of the scalp. In the back and sides of the head (occipital and parietal regions), hair growth is down and to the back. At the temples, the hair abruptly changes its orientation from forward to down, and then back. From the crown area forward, including the top of the head and frontal region, and frontal hairline, the direction of growth is forward. So we see the crown as the center of the growth swirl, or the “merging” of these differing hair angles. The logistical and cosmetic importance of this will become clear as the discussion continues.

### Hair Loss Patterns in the Crown

The Crown is involved in many of the hair loss patterns that we see clinically, and not just the Norwood, or classically “male” patterns; it is also part of the Ludwig, or typically “female” forms of pattern baldness. The crown may be affected in any of the three degrees of Ludwig presentations. (Notice that women can sometimes develop a Norwood, and men a Ludwig, type of balding). That being said, let’s take a look at crown involvement in Norwood types of balding.

Norwood Class IV through VII all entail loss in the crown, but with increasing magnitude; Class II and III do not. However, we have additional groupings, the II Vertex and III Vertex; these are the same as the II and III, but with a “bald spot” at the crown. Again, the more advanced IV, V, VI, and VII patterns all represent at least some crown loss. However, there are the “A” variants, II through V, which involve only the front and top of the head, excluding the crown. Finally, some patients present with no frontal loss at all, just exclusive crown loss (the isolated bald spot).

### Challenges in Crown Restoration

Two essential groups of problems arise when dealing with crown balding. The artistic/aesthetic difficulties crop up when transplanting an area characterized by a swirling vortex of hair directions, often with thinner hair toward the middle. Also, this configuration amounts to a circular “part” which exposes the scalp, and any transplanted groups, to fairly close examination in social settings. Therefore, it is a technically challenging area in which to create appropriately placed and oriented recipient sites; and the correct size grafts must be placed in different regions of the crown.

The other major difficulties are related to supply and demand. The potential size alone of the crown can create an insatiable demand for donor hair, which, as we have seen, is limited. Let’s consider the mathematics of this and other regions: the frontal area, from the hairline back to a line drawn across between the two temporal angles, measures an area of roughly 50 cm<sup>2</sup>. The top of the head, from behind the frontal area to the front border of the crown, may be about 150 cm<sup>2</sup>. The crown, as we pointed out can vary widely in size, but in a Class VI or VII patient can be as large as 175 cm<sup>2</sup>: a lot of area to cover! Doing the calculations, we see that, even if we transplant a minimal density (say, 15 FU’s or about 35 hairs per cm<sup>2</sup>) to a fully bald crown (about 175 cm<sup>2</sup>), we have used roughly 2600 follicular unit grafts. If we go for a higher density, for example, 40 FU, then we have used 7000 grafts, more than the average person even has available in their donor area. Again, this is in the crown alone. This leaves the cosmetically important frontal area and hairline with essentially no donor hair for transplantation.

While the above example is an extreme one, it is used as an example to show just how much of the donor reserves can be exhausted by the injudicious attempt to fully restore the crown with high density. In a young, desperate man with new onset crown balding, it may be tempting to try to fill this area in with dense packing of grafts; this, however, could be to his long-term detriment. If the balding in the crown continues to expand, the patient and surgeon can find themselves “chasing” the balding with ever increasing circles of grafts, like the layers of an onion. Not only can this quickly deplete the donor area, but if the hair characteristics and donor density are unfavorable, he may find himself with an “island” of dense crown hair sitting

amidst an ocean of bald scalp. Moreover, what is he to do if frontal balding ensues? The man who was desperate about his crown balding at age 24, is bound to be absolutely frantic when his hairline starts to recede at 28; this will be even more noticeable than the hair loss at the crown.

Often, especially in younger men, it is appropriate to use medical management with Propecia and/or Rogaine, which tend to be more effective in the crown area than frontally. This may help at least maintain the hair in the region; surgical planning can be done to include hairline restoration, and transplantation to the frontal area as far back as the crown. This will be a more beneficial use of donor reserves from a cosmetic standpoint. The crown can then be transplanted carefully and judiciously, perhaps with a lower density, and the advancement of the patient's hair loss can be observed over time. We must always be mindful that the large crown can drain the donor reserves, and that transplanted density is often best "spent" on the top, in the frontal area, and at the hairline.

# Chapter Twelve

## The Procedure Itself: The Nuts and Bolts of Hair Transplantation

### An Office-Based Surgery

So far, we have discussed a wide variety of hair restoration techniques, although we have concentrated on Follicular Unit Transplantation (FUT). That will be our entire focus here. We do not perform the outmoded large graft or mini-grafting techniques, flaps, or scalp reductions; as such, we will confine our discussion to what we consider the state of the art in hair restoration surgery, which is FUT done in an office setting.

Another topic we will neglect is the administrative, legal, and financial aspects of the agreement by the patient to undergo FUT by the surgeon. It is not that these are not important, for they are, and they need to be understood by all parties and the details completed prior to the procedure's beginning. However, they are beyond the scope of this discussion. This entire manuscript is aimed at educating the patient, or potential patient, and to demystifying the process of hair transplantation. Therefore, we are limiting our comments to those pertaining directly to the history, practice, art, and science of modern and post-modern hair restoration surgery. The more prosaic elements of the patient's interaction with staff and physician will be left to the time and place of that interaction.

### Pre-Operative

The pre-operative phase is that period leading up to the performance of the surgery. Sometimes, certain medications, like antibiotics, will be started the night before. Occasionally, in extremely anxious patients, sedation or sleeping medication will be given the previous night as well, to insure a good night's sleep. It is the rare patient that requires this extra effort. Photos may be taken from various angles to document the level of pre-operative balding. The patient may have a movie they wish to watch, or music they wish to hear, during the procedure. This can be determined in advance or after the surgery begins.

Often, a brief second consult with the surgeon takes place, during which the patient may restate his or her goals and desires, and the surgeon may respond or help the patient modify these goals into a more realistic and aesthetically appropriate plan. The physician may at this point draw in the hairline with a surgical marker, with the patient observing in a mirror, and may mark other points, such as the boundaries of the crown, if that area is being grafted, and reexamine the donor area for scarring, density, and laxity. This is a good time for final questions relating to the surgical plan, and the long-term

plan, to be put forth, so that all parties are satisfied that they are moving forward with an acknowledged and satisfactory effort on the part of the patient.

At this point, after checking for the presence of drug allergies, medication for limiting swelling and inflammation may be administered. Other drugs for sedation may also be given. This will be discussed further in the section below.

### Sedation

Is sedation mandatory for follicular unit transplantation? Strictly speaking, no, it is not. However, there exist many good reasons for using mild sedation for this procedure, not the least of which is the patient's comfort during what may be a long procedure. Much of the time spent in the surgical chair can be quite boring. There are other reasons, though, as we shall see.

The only part of FUT that is remotely painful is the injection of the numbing medications, or local anesthetics (see below). This is necessary in the donor area in back and also in the recipient areas that will receive the grafts. This is one of the first things that are done during the operation, and it can sting a good bit. People demonstrate a wide range of pain tolerances, and it has nothing to do with being strong, or "manliness", or a lack of these attributes. It's simply how our nervous systems are "wired". For some patients, the injection of local anesthetic barely gets their attention; they continue talking as though nothing was happening. For others, the shots are quite bothersome, and they may begin to sweat or feel dizzy. So often, if a little sedation is used at the beginning of the procedure, this potential for pain and anxiousness is relieved before it even occurs.

Another reason for using the type of sedation we prefer is that it can prevent or relieve the potential side effects of the local anesthetics we use (see below). Generally, we choose a class of drugs known collectively as the benzodiazepines, specifically diazepam, midazolam, and lorazepam. These are similar to the drug Valium, and are considered sedatives and anti-anxiety agents. They may be given orally, intravenously, or intramuscularly; the intravenous route works the quickest and the oral route has the longest time to onset of effect. Used appropriately, they are quite safe, and we seldom see complications associated with their use. Given by any of the methods above, these medications render the patient relaxed, maybe slightly drowsy, and usually with a noticeable sense of wellbeing. The local anesthetic injections may become unnoticeable, or just a slight annoyance. Depending on the drug used and the route by which it is given, it may last an hour, or several hours. We have found this method of sedation to be safe, effective and well accepted by our patients.

Some physicians routinely give opioids, or narcotic type drugs (pain relievers). Although this class of drugs is quite effective as well, it does not relieve anxiety as well as the Valium class of drugs, and in some instance can cause dysphoria (a sense of non-wellbeing). Also, the narcotics have a much stronger effect on the respiratory centers in the brain, and can depress the breathing. Moreover, they can cause nausea and vomiting quite frequently, which is distressing to the patient (and the last thing you want is vomiting in a fresh hair transplant patient – you could pop a graft!). Also, itching is a common side effect of narcotic drugs, which can be a miserable situation for the operative team and for the patient during a long case that requires stillness on the part of the transplant recipient. Lastly, if these narcotics are used along with the Valium type of drugs, a synergistic action takes place: they may greatly enhance one another's effects, which could lead to depressed breathing, over-sedation, lowered blood pressure, or other problems. For these reasons, we usually choose not to administer opioids/narcotics, and try to stick with the relatively safe, tried-and-true sedatives mentioned above (the benzodiazepines).

Others have advocated the use of nitrous oxide (N<sub>2</sub>O, or laughing gas). While this drug can be a quick acting, effective sedation and pain relief agent, there are problems with its use and its effects, too. First of all, it requires a more complicated system (you may have seen these at the dentist's office) than for the oral or injectable agents. Secondly, it must always be used with oxygen, and both oxygen and nitrous oxide come in relatively bulky metal tanks. Special monitoring of the patient's vital signs is necessary, and when the nitrous oxide is stopped, the patient must always inhale pure oxygen to avoid decreased levels of oxygen in the blood (called diffusion hypoxia). Occasionally, patients will experience dysphoria, which may present much like a panic attack; this quickly resolves with discontinuation of the gas.

Others promote the use of heavier sedation, citing the patient's comfort, the length of the procedure, and the ease with which the surgical team may work, as their rationale. This author feels that, unless one has a strong anesthesia background, that the benzodiazepines (Valium family of drugs), and, possibly, the less potent opioid/narcotics, should remain the agents of choice for sedation in hair transplantation.

### Anesthesia

Many people think of anesthesia as being "put to sleep". However, there are other ways of achieving anesthesia, which just means rendering one insensitive to pain impulses. In hair transplantation we use local anesthesia, which, as the name implies, locally deadens (temporarily) the nerves, rather than the whole central nervous system (unconsciousness). This is most desirable because, when using local anesthesia, no pain is felt, the procedure can be done in the office, we avoid the expense and hazards of the hospital

operating room and general anesthesia, and the patient is awake throughout the process, and can remain an active participant in decision making.

There are two main classes of local anesthetics: esters and amides. The esters are more prone to causing allergic reactions than the amides, and are less widely used. Even amongst the esters, however the incidence of true allergic reactions is extremely rare. Very often, people claim an allergy to "Novocaine" or all the "-caine" drugs, when they have actually experienced either a temporary reaction to too much anesthetic (mild overdose), or a reaction to the epinephrine (adrenaline) that is often added to local anesthetics to prolong their action and to decrease bleeding.

The most widely used local anesthetic agents (LA's) in hair transplantation are of the amide class, namely, lidocaine (Xylocaine) and bupivacaine (Marcaine). These have an established safety record, and we rarely see problems with them. Comparatively, they are similar in effect, with lidocaine being faster acting, and bupivacaine lasting for a longer time. They are injected into the skin and subcutaneous layers, and/or around larger nerves in the form of nerve blocks.

There are several areas where nerve blocks can be used. The first is the occipital nerve, which is in the back of the head, above the neck. When this nerve is blocked, the back of the head (donor area) and crown are numbed; this can be of benefit after the surgery, also, as the donor area may be painful that night. The supraorbital nerve, above the eye, may also be injected; this results in hairline and frontal area numbness. Two other nerves in front and behind the ear may also be blocked to help with anesthesia in the top of the head and around the sides.

However, we do not do the surgery with just the blocks; we always inject locally, wherever incisions will be made. One of the reasons for this is that the blocks may be incomplete at times, and we want the scalp completely numb and unable to feel any pain; the other reason is to add epinephrine (adrenaline) to the area. This has a two-fold purpose: 1) to prolong and intensify the action of the LA's and 2) to constrict the small blood vessels in the area and decrease the amount of bleeding. The importance of diminishing the amount of bleeding, especially in the recipient area, cannot be overemphasized. The less bleeding there is, the more easily and accurately the recipient incisions can be placed; likewise, with minimal bleeding, placement of the FU grafts causes less trauma to the follicles and is generally smoother and quicker.

### Intra-Operative

Once the initial steps determining the hairline, the areas to be grafted, and the extent of the donor strip, have been carried out, and the areas have been

marked and trimmed, then the local anesthetics are injected into the donor area, and then into the scalp in the areas to be transplanted. The numbness is essentially instantaneous; after these injections various sensations like pulling or tightness may be felt, but there is no pain sensation.

The first incision is for the donor strip. This is done with a single or double-bladed scalpel, and is performed with a “tumescent” technique. What this means is that a fairly large volume of fluid is injected into the numb donor area in order to raise the hair follicles up off the scalp; doing this allows us to cut more easily without damage to underlying nerves and blood vessels. In addition, when we free up the strip from its deeper tissues, we can do so with minimal damage to the bulbs of the follicles. Since the tumescent fluid is a saline solution with dilute amounts of local anesthetic and of epinephrine, the technique also helps to decrease bleeding and ensure that no pain is felt at any level of the dissection.

Once this donor strip, with its many intact hairs, is harvested, it is handed off and the important, meticulous “slivering” begins. As you recall, slivering is the process of dividing the strip, under the microscope, into small pieces that are one FU wide. As these slivers are created, they are passed off in turn to other members of the operative team, who begin the long, arduous task of dissecting out the individual FU’s under stereo-microscopic guidance. As they are dissected out, the FU’s are segregated, according to type, into groups of singles, doubles, and so on. They are kept in chilled saline solution until they are ready for planting in the scalp.

Meanwhile, the surgeon sets about closing the donor site. This may be accomplished with sutures or surgical staples. We prefer the use of sutures rather than staples; they tend to be less uncomfortable, and, because we generally use dissolvable sutures, the patient does not have to look forward to returning in 7 to 10 days for staple or suture removal! The ease or difficulty of the donor site closure is to some degree dependent on the tightness or laxity of the scalp. This is one more reason that we try to take great care with the donor area; multiple scars and poor closures not only deplete donor hair, but also contribute to tightness of the scalp, and subsequent difficulty with approximating the wound.

After the donor site is closed, then the surgeon begins the tedious and painstaking process of creating the hundreds or thousands of recipient sites. These are generated using small needles or tiny scalpels; the size of these miniscule incisions is based on several factors: the area of the scalp, the thickness and laxity of the scalp, and the size of grafts (one hair, two hair, etc) that will be placed. Great care is taken to avoid damage to existing hairs, and all this work is done under magnification (as is the harvesting of the donor strip).

The tumescent technique that is used for the donor strip is also used to some degree in the recipient area. A saline solution, containing local anesthetic and epinephrine, is injected into the area, to "plump up" the scalp; this makes it less likely for the needles and scalpel blades to lacerate blood vessels below the layer of the hair bulbs, and thus interfere with nourishment to the new grafts. And again, it decreases the amount of bleeding from the scalp, which greatly facilitates the creation of the recipient sites, and of the graft placement; this in turn may improve survival and growth of the FU grafts.

After the sites are created, and as the ongoing work for dissecting grafts under the microscope proceeds, members of the team begin the fine work of placing the individual FU grafts. This is done, under magnification, by gently grasping the delicate connective tissue at the base of the graft with ultra-fine jeweler's forceps, and sliding the graft into its waiting recipient site. This is more difficult even than it sounds; the level of expertise required is nothing short of amazing. Not only must the FU's be placed at the appropriate angle, with as little trauma as possible, but it must be done quickly and smoothly; remember that we try to minimize the number of hours that the grafts are "out of body", and that we may be creating and placing thousands of grafts. This procedure is not possible without a large, expert and highly motivated surgical team.

Of all the steps of the surgical procedure, this graft placement phase may be the most relaxing, or boring, for the patient. Many patients will "unwind" and nap during this time. Hours may go by just sitting and chatting; this is where music and movies may be a blessed relief. These are not distracting to the operative team; they are used to maintaining high levels of concentration during hair transplants.

One question that is often asked is "what do we do with 'leftover grafts'?" Answer: there are none. In other words, we try meticulously to match the number of grafts harvested with the number of incision sites made. Often, because of the careful techniques of graft cutting employed, there are more grafts than planned for. If this is the case, they do not go into the wastebasket! The patient gets those extra follicular units "on the house!"

At the end of the procedure, a final check is made to insure that every graft is in place, that no "popping" or extrusion of FU's has occurred, and that no bleeding is taking place. The hair is dampened and combed very carefully, again to avoid any graft displacement. We generally use no dressings; if the patient is using GraftCyte, they may leave the clinic with several of the saturated gauzes in place over the grafted areas.

Patients will receive post-operative instructions at several stages of the treatment: often before, during and after the procedure, as well as in writing. Repetition of these guidelines is important for several reasons. Patients need

to follow these directives carefully in order to insure the best possible growth of grafts and avoidance of complications. Also, people often forget what they are told within the context of the procedure, due to excitement, anxiety or information overload. Therefore, we try to reinforce the information at several points during the patient's entire surgical experience. We will discuss the post-operative course within the next section.

# Chapter Thirteen

## Post-Operative Course: What to Do, What to Expect

### What to Do (and What Not to Do!)

So you've finally had that long-awaited hair transplant, and you are ready to go home and start growing hair! Well, that's great, but let's slow down a bit and think about all the things that may help in insuring the best possible outcome for this procedure. Above all, follow the instructions you've been given; they are there for a reason, and much energy has been put into developing a set of guidelines for patients after FUT. After all, you have paid in money and time for the operation, and the surgeon and his team have performed a meticulous and demanding procedure. Why not do everything in your power to tip the scales in your favor?

Read over the written instructions for post-operative care several times; consider reviewing it again the following day until you are familiar with all the points being emphasized. This is very important because some of the vital details may be forgotten, with the excitement of the surgery, and also with the sedation you may have received, that can cause the fine points to be a little "fuzzy".

Pain medications will be prescribed, but it is unlikely that these will be needed for more than one or two days, at the most. Sometimes a little Extra-Strength Tylenol is all that is required. Sleeping medication may also be used for the first night, or rarely the second or third. You may also have medication to prevent swelling; sleeping with the head elevated on pillows for the first week may also help prevent this common experience.

Regular washing of the hair is important after the surgery. There is a tendency to think that this will disturb the grafts, but if it is done as recommended, the chance of dislodging a graft is remote. The shampooing helps remove dirt, blood and oil, and will gently dislodge the "crusts" or scabs that form over the recipient sites; these crusts should normally be gone within a few days to a week at the most. If they are not, you may not be shampooing effectively enough. Proper hygiene also helps prevent infection, and promotes the normal shedding of the transplanted hairs that occurs before they begin their new, "relocated" growth phase.

Keeping the recipient and donor areas moist promotes their healing. GraftCyte, or even saline solution, sprayed on the grafts a number of times a day assists in the process. GraftCyte makes a product especially designed for use over the donor incision; any thick ointment, such as antibiotic-based ones, will work well. These measures also will decrease the tendency of healing tissues to itch. This is more important than it sounds. For the first few

days, you may experience significant itching in the donor and recipient areas. Scratching the donor site in the back will cause little trauma; in fact, it is beneficial to keep the donor incision free from debris, crusts, and any accumulation of dirt and ointment. The graft sites, on the other hand, are a different matter. They are the most susceptible to trauma during the first three or four days, which is also the time when they may itch the most! Keeping them moist with saline or GraftCyte is the single most important factor in soothing and preventing this pruritis or itching sensation. Vigorous rubbing and especially scratching with the fingernails can easily dislodge grafts, which may cause mild bleeding, but more importantly, loses one or more of those valuable hairs.

### What to Expect

One of the most misunderstood aspects of FUT is the shedding of the new hair. Many patients either aren't told, or do not hear, that the majority of the newly transplanted hairs will fall out, in a process known as anagen effluvium, within the first 3 to 8 weeks. Often, this happens in a wave at about weeks 3 to 4. Patients may be quite upset if the beard-like stubble they have been proudly caressing many times a day is now becoming absent. This is perfectly normal and to be expected for 90% of the FU grafts. They return from about 3 to 6 months post-operatively; initially, they emerge as finer hairs, and gain length and diameter as their growth continues. By the end of the first year, the "new" hairs should be as robust as the other, "native" terminal hairs. They will also gain length at the same rate as non-transplanted hairs, which is roughly one half inch per month.

Sometimes during this first month, the patient may notice small hairs being shed along with their bulbs. They may even come out along with the small "crusts" within the first week or two. All this is normal, and it must be understood that the germinal material, which will be the source of the new hair, is still inside at the base of the follicle. Unless there is bleeding at a graft site, there has been no loss of a viable graft.

Infrequently, there is some textural change in the transplanted hair. It may become curlier than it was, or even somewhat wiry; often the luster of the hair is also diminished if this altered texture occurs. When examined microscopically, these hairs reveal some changes in the cuticle, or outer covering of the hair shaft. This phenomenon is temporary, and resolves with the normal growth cycles of the hair often in 12 to 18 months.

The donor area is a much larger incision than the tiny slits in the recipient area; therefore, it is often a bit more worrisome than the transplanted regions. Remember, it has been sutured, and any sutures cause some degree of inflammatory reaction. This reaction is characterized by mild swelling and discomfort. Also, there will be an initial swelling and soreness from the

surgical trauma of excising the donor strip. The discomfort and associated numbness usually decreases rapidly over the first 3 to 4 days; most of the soreness is gone at one week, but the numbness may persist for several months. In the latter case, the numbness gradually decreases as the nerves grow back until it is unnoticeable.

Another commonly misconstrued aspect of FUT is so-called “shock loss”, or telogen effluvium, in which hair close to the tiny recipient incisions is irritated or “shocked”, leading to temporary or permanent loss of the hairs. If this does occur, it will happen at about 2 to 3 months after the transplant, and consists of preexisting hairs in the recipient area which go into the telogen, or resting stage, and are shed. This may be cosmetically significant if many hairs are lost at once. However, miniaturized hairs, which are programmed to be lost soon anyway, are much more susceptible to shock loss than strong, terminal hairs. If terminal hairs are lost, they generally grow back, just as they would after a normal resting phase. The miniaturized hairs are less likely to return. So, in a way, the effluvium simply “fast-forwards” the individual’s hair loss to the state it would have been in with the inevitable loss of the fine, miniaturized hairs.

Planning for possible telogen effluvium is important when transplanting, especially in the case of younger men with a history of fairly rapid hair loss. Adequate numbers of FU grafts must be placed when implanting through areas containing high numbers of miniaturized hairs. If these hairs are lost to shock, the patient may appear balder for several months, before the terminal hairs grow in with adequate strength and length to provide coverage. It is important for the patient to understand the natural process of balding, and the concept of miniaturization, so that these events can be seen in context.

Many patients will experience good coverage in just several months, but the full cosmetic effect of the transplant may not be evident for up to a full year, because of the factors mentioned above. Once the hair has reached optimal styling length, then the patient can be assessed for a possible second procedure, if that is even felt to be necessary. In the next section, we will discuss the reasons for and goals of a subsequent procedure.

# Chapter Fourteen

## Additional Procedures: When, Why, and How Much?

### The Importance of Planning

It is imperative that the probability of second or subsequent procedures be discussed prior to the first follicular unit transplant. This is an integral part of the long term planning that is necessary to afford the best outcome. Multiple factors are considered in making this judgment, including age, degree of baldness, rapidity of hair loss, hair characteristics, donor density, scalp laxity, styling preferences, and previous procedures. Let's take a more detailed look at each of these factors.

### Age:

Ironically, it is often the case that older men, with more extensive balding, are better candidates for a single procedure than are younger men with less advanced patterns of alopecia. The older man who has lived with baldness for a number of years is likely to have more realistic expectations of his transplant outcome; he may be very satisfied with thin coverage, and a frame for the face. In addition, his degree of balding, that is, his Norwood pattern, has very likely "declared" itself, leaving little ambiguity in the surgeon's mind about how future hair loss will alter the clinical picture.

The young, often rapidly balding man may be more intransigent, and therefore more difficult to counsel. As we discussed earlier, his vision of the appropriate hairline for himself can be wildly impractical. Furthermore, the patient in his early twenties with, for instance, Class III, III-A, IV-A or just limited crown balding is, to some degree, an enigma. How quickly and how extensively will he lose his hair? An attempt, through a large, single session, to densely transplant all the thinning areas may not be the best option. The patient may experience acceleration of hair loss via effluvium, or his hair loss could simply develop rapidly during the growth period for the new grafts. If donor reserves are limited, and baldness progresses rapidly, he could eventually be dissatisfied and unable to proceed with further surgery. This patient needs to know that he may require two or more procedures to appropriately follow the progression of the hair loss, and to properly conserve his donor resources.

### Degree of Baldness:

In a patient willing and able to undergo a large session, sometimes the more advanced levels of balding are amenable to a single session. The stability of the hair loss is estimable, expectations are likely to be reasonable, and the goals are easy to state. In a single, large session of FUT, a hairline and framing for the face can be established, top and crown coverage may be

possible, and the result can stand on its own with a natural appearance. As we discussed above, however, the more limited patterns of hair loss in younger men present us with a dilemma; do we wait, and if we transplant, where and how much? These are just a few of the reasons that a consultation with a trained and knowledgeable hair restoration physician is of the utmost importance; there are many artistic elements to be considered, as well as an acute understanding of both the natural history of balding, and of the patients mental and emotional condition.

#### Rapidity of Hair Loss:

A young man who sees his hair vanishing before his eyes is likely to be in a vulnerable and suggestible state. He most of all needs the truth, delivered with an attitude of temperance, understanding, and hopefully, optimism. If he is quickly progressing towards a Class VI or VII pattern, he needs to know that complete crown coverage, for example, may be difficult. Patients with earlier stages of balding, who have had a recent and rapid onset, or who have just noted an acceleration of their hair loss, will need counseling about the advisability of postponing the surgery; they must also understand the probable necessity for multiple procedures and their particular suitability (or unsuitability) for ongoing surgical work.

#### Hair Characteristics:

In general, the more favorable the hair characteristics, the more likely a single session may be adequate for the patient's needs. Low contrast between hair and skin, curliness or waviness, coarseness of the hair (except when there is high skin/hair contrast), light-colored or salt-and-pepper hair all lend themselves to the possibility of greater coverage with a lower transplanted density. To some extent, these favorable characteristics can compensate for extensive balding and less than wonderful donor density.

#### Density and Laxity:

We will consider these two factors together, as they are so intimately related. The donor area must be evaluated, both for density and for laxity, in all patients consulting for possible FUT. (Any significant miniaturization in this area may mean the patient has an unstable donor area and may not be a surgical candidate at all).

If the density is properly calculated, the total number of movable hairs and movable follicular units can be estimated with reasonable accuracy. This estimate is obviously of great value in determining a plan based on the knowledge of the existing donor reserves. However, a determination of the density is not enough; the laxity of the scalp also plays a role in the adequacy of the donor reserves. If the scalp is excessively tight, either naturally or as

the result of scalp reductions or previous donor harvests, this may limit the number and size of strips that can be excised in the future.

If both density and laxity are favorable, then it is possible that presently bald areas can be more densely transplanted, knowing that adequate donor reserves remain to account for progression of the hair loss pattern. This knowledge gives the patient and the surgeon more flexibility in their approach to current hair loss, and more confidence in facing the eventuality of progressive baldness.

### Styling Preferences:

A patient who prefers the hair combed straight back may have even extensive balding treated with a single procedure. This is because the crown area can be lightly transplanted, or not at all, and still appear as a pattern found in nature. Also, the crown can be covered by the hair from the front and top of the head when it is styled thusly.

Those who prefer combing to the side may achieve a look of greater fullness, but may sacrifice coverage of the bald crown, if inadequate donor supply exists. Hair which is allowed to naturally curl may enhance the illusion of thick coverage, as will a “dry” look, as opposed to a “wet” look.

### Timing of Subsequent Procedures

Although a repeat FUT may safely be done as soon as the new hairs are in evidence, and, indeed, space will exist between previously tightly placed FU's for new grafts, there are valid reasons for postponing a second procedure for 8 to 12 months. One is allowing the scalp to regain some of its lost laxity. As the months go by, the scalp will stretch to some extent, which will potentially allow a greater harvest, and will facilitate an aesthetic closure of the donor site. Also, it takes about 8 to 12 months for the full cosmetic benefit of the transplant to become evident. At this time, the patient and the surgeon can make better judgments as to the degree of further work that needs to be performed. A more uncommon issue is that of telogen effluvium in the donor area; if this should occur, it is best to give the follicles ample time to recover, so that they are more likely to be seen and preserved during follicular unit dissection.

### Purpose of the Second Session

There are a number of common goals in carrying out a second (or subsequent) session. One is to refine the hairline (see Chapter Ten). No matter how meticulous the original placement, it is impossible to anticipate what the true effect will be once the transplanted hair has grown in. Density can be added to the hairline, it may be lowered, made more or less

symmetrical, or the temporal angles may be altered. A widow's peak may be created or accentuated and, if the hairline is too straight, it may be rendered more irregular in order to "soften" it. In a patient with advanced, stable baldness and adequate donor reserves, the receded temples may be restored.

In addition to hairline refinement, the crown may be transplanted (see Chapter Eleven). The necessity of this will be more evident after the transplanted front and top are well grown in; the patient with a new hairline and adequate top coverage may be satisfied with a natural, "bald spot" crown appearance, or may wish to go forward with doing the crown if donor reserves and hair characteristics are favorable.

If the hair loss has continued to be rapid, or if much time has elapsed after the initial transplant, a second session may be undertaken simply to follow the progression of the baldness. There may have been permanent "shock loss" of many miniaturized hairs; there may be cosmetic consequences from this. The baldness may have proceeded more toward the back, or the affected area may have widened.

Often, the reason is to add fullness, which is done by increasing the density in the recipient areas. Even though the FU's may have been placed quite closely during the first session, with the healing of the recipient sites, there will be intervening space available for further grafts. This can create a further fullness, as long as the hair loss is stable enough and the donor supply is plentiful enough.

To reiterate, none of these considerations should be a surprise to either the surgeon or to the patient. The possibilities must be taken in to consideration early on, before the first procedure; this education is part of the physician's responsibility. However, in the interest of self-empowerment, and simply as an informed consumer, the patient is compelled to read, research, ask questions, and become as informed about the long term probabilities as he is about the short term outcome.

# Chapter Fifteen

## Long Term Planning: The Absolute Necessity

### Why Plan Long Term?

“Well, after all, I want to look as good as possible right now. I’ll deal with tomorrow when it comes”. “Doc, I just want my hair back now, while I’m young enough to enjoy it. Do whatever you’ve got to do”. “Make me look like (fill in the blank with celebrity/actor/musician of choice)”.

These statements and requests are understandable when one is dealing with hair loss, especially in the younger man. We have great empathy for the feelings behind them; some of us have been hair loss patients, too. However, such communications are also indicative of an attitude that can lead to future frustration and heartbreak, and to antipathy toward the surgeon who was foolish or greedy enough to indulge these fantasies.

Remember that with hair transplantation, it is mathematically impossible to recreate the density of youth in the bald and potentially bald areas, given the current limits of the permanent zone, or donor area. Nor is it cosmetically necessary. We work with creating the illusion of density in the balding regions, by the artful placement of grafts in a way that maximally blocks light penetration to the scalp. Indeed, hair restoration surgery does not “cure” baldness. We simply move hair around in order to ameliorate the appearance of thinness or balding.

The technical aspects of these procedures require intense training, good hand-eye coordination, excellent surgical skills, a steady hand and a sharp eye and the ability to concentrate and endure tedium. The artistic and aesthetic aspects, on the other hand, require an integration of both cerebral hemispheres (right brain/left brain coordination). This cannot be “book-learned”; it is either part of a physician’s basic constitution, or it is not. It may be honed and improved upon, but it is not created by taking courses or by sheer force of will. Poor performance can lead to less than desired outcomes.

Sadly enough, cosmetic disasters can also be the consequence of poor planning. Even with the use of follicular unit transplantation and associated state of the art techniques, lack of artistic foresight and proper patient selection and education can eventually lead to an unnatural appearance, premature depletion of donor reserves, visible scarring, unequal distribution of hair, unnecessary surgeries, patient dissatisfaction and frustration for all involved. It is better to risk initially disappointing the patient who has an overambitious or unrealistic plan, than to rush into surgery without a mutually agreeable, long term plan in mind. Postponing or even refusing surgery with such an individual is the ethical and moral course of action.

### What to Look for in Your Surgeon

First of all, you should have a consult with him, and not just a non-physician consultant. Since we've brought this issue up here, let's talk briefly about the role of the non-physician consultant. These are individuals who may know a great deal about the process and results of hair restoration surgery. They may be former patients themselves, and they can play a valuable role in helping educate and reassure prospective hair transplant recipients, and assist them through the process.

Some patients have done a fair amount of reading (often on the internet) about hair transplantation. Some of the information they have received is valid, and some of it not. The consultant can help separate the hype from the truth in these cases. On the other hand, some patients are essentially without any semblance of a knowledge base regarding their options, and require much more in the way of education. In either case, the consultant is paid to educate patients, facilitate the process, allay their fears, and often, to act as a primary contact person.

What the consultant is not paid for is to profit personally by the patient's decision to have surgery. Unfortunately, in some organizations, the role of the consultant is just that: to make a commission on each procedure and on every graft that the potential patient receives. The conflict of interest is obvious, and we do not believe in the use of commissioned consultants. The physician, the consultant, and the other members of the team are integral to helping the patient make an informed and rational decision as to if, when, and to what extent any surgical procedure will take place. Coercion, manipulation, and financial incentives have no place in an ethical hair restoration practice.

So, in addition to any other staff members the patient sees and works with, the role of the hair transplant surgeon is primary. This is indeed "where the rubber meets the road". The surgeon must, above all others, gain the trust of the patient, help him with the often difficult decisions that must be made, and also counsel him against making possibly irrational and fear-driven choices.

Your surgeon should check your hair carefully himself. Some form of magnification is necessary to evaluate the degree of density, and also of miniaturization. Beware if he just ruffles your hair, briefly rubs your scalp, and says that his experience allows him to "just eyeball it" and make a judgment regarding these factors. This cavalier approach does not honor you or the complexity of modern hair transplantation. Surgeons now have the information, the techniques and the tools to carry out the appropriate pre-operative planning and counseling, and they should do so!

He can tell you about your particular pattern of balding, your likely progression, the amount of donor reserves he estimates you have, what your hair characteristics are, and how all of these factors will play into the decision-

making process and your likely outcome. Will multiple sessions probably be required? How many grafts might you need for an initial session? What areas of the scalp are most important for you cosmetically? All these questions and more must be answered to your satisfaction.

Remember that medical treatments like Propecia and Rogaine are adjunctive; in the context of long term planning, we must assume that they will not work, or that their action will be less than optimal, or will decrease in effectiveness over time. This does not imply that they should not be used, but it is foolhardy to make surgical planning decisions for the present or the future based on "Propecia maintaining the crown" or "Rogaine filling in the density on top". Similarly, to count on new advancements such as more powerful medication or hair cloning in making these decisions is irrational. Properly planned and performed follicular unit transplantation should be seen as a lifelong investment that will stand on its own and stand the test of time.

If you are very young, and anxious, and you are not sure you are the best candidate for hair restoration surgery, how eager is your surgeon to operate? Is he willing to postpone and reevaluate in a year after medical treatment, or is he still pushing you to "sign up?" Sometimes the most ethical and caring physician is the one who tells you what you don't necessarily want to hear. This is born out of an overriding concern for what is in your best interests. Honesty is of paramount importance in dealing with someone as vulnerable as a young person experiencing rapid hair loss.

### Your Role as the Patient

It is said that patience is a virtue. This can be very true for the hair loss patient, and also very difficult to achieve. Remember, only a trained hair restoration surgeon can properly evaluate and counsel you as to your options, or lack thereof. Educate yourself. Communicate with your doctor, and let him know your fears; we deal with these issues day in and day out, and you are not alone in your concerns. We have heard the same questions and misgivings from other patients. Many of us have had these procedures ourselves, and have sat in the "patient's chair".

Don't fall into the trap of being too compliant ("Whatever you say, doc, you're the expert!"). This attitude may seem to make things easier and faster for you and the doctor, but it is less than ideal. The more you are in true agreement, the happier both parties will be in the end. On the other hand, a resigned or downright hostile attitude ("Go ahead, doc, you're gonna do what you're gonna do. I'm the next victim!") is just counterproductive at the least, disastrous at worst. Again, there must be a real consensus of opinion and plan before you take your seat in the surgical chair.

In the rush to "get hair growing", don't forget to be realistic. Adolescent density is not probable, nor is it necessary. An adolescent hairline is

inappropriate and odd-looking in someone middle-aged (and, someday, young people do become middle-aged. Take our word for it!) Moreover, despite your feelings at twenty-five or thirty-five, you will care about your appearance at forty-five and fifty-five, and for life. A balanced, symmetrical, natural hair transplant, done at any age, will serve you well for the duration.

# Chapter Sixteen

## Hair Loss and Restoration in Women

Although a large percentage of the balding and thinning population in this country are women, they are much less likely to seek help from a hair transplant surgeon than are men. True, women's hair loss is less liable to benefit from transplantation than is men's, but large numbers of female patients who could greatly benefit from surgical hair restoration are unaware of this option.

Indeed, many women with hair loss are excellent candidates for hair transplantation. The important understanding is that women's hair loss occurs in different patterns than men's, and therefore must be generally treated in a different manner. Moreover, hair loss in women is much more likely to reflect an underlying illness; we must be sure a proper medical workup is done before recommending any medical or surgical alternatives.

### Psycho-emotional and Social Issues

As emotionally devastating as hair loss can be for some men, the effect often pales compared to alopecia in women. In men, baldness is seen as a less than desirable, but still sometimes expected and normal part of the male life experience (although to the man who is balding, it may seem like the end of the world). On the other hand, when hair loss occurs in women, at any age, the resulting feelings and emotions may be overwhelming. Balding is perceived as a strictly male occurrence, and unacceptable in females. For even the elderly woman, this can threaten her very sense of self, of her femininity and sexuality, and of her place in family and society.

Our culture strongly identifies femininity with a thick, lustrous head of hair. From Rapunzel to the Breck Girl, images of full bodied, shining hair are synonymous with female attributes, sexuality, desirability and vigor. Thinning, dry, lusterless hair is identified with illness, old age, and poverty. In truth, there are a number of systemic diseases that may cause hair loss in women, much more so than is the case with men. It seems that the hair follicles of women are more sensitive to certain stressors (sources of stress) than are those of men; thus, we are more likely to see widespread hair loss in females, rather than the typical regional balding patterns of males. Let us look for a moment at some of the causes and varieties of female hair loss.

### Causative Factors in Women's Hair Loss

Just as in men, women's hair loss may involve genetic and hormonal factors. As we discussed in previous sections, the three elements at play in androgenetic alopecia are androgens (male hormones), genetics (a predisposition), and the passage of time (aging). Although the loss patterns

we observe in women tend to be different than in men, the mechanisms are similar. Because women have different levels of certain enzymes in the follicles in various areas of the scalp, they may lose hair in quite distinct and different ways. For example, women very often will retain the frontal hairline that is so commonly lost in men, but have widespread miniaturization and thinning on the top and vertex. This may in part be due to women's low hairline levels of 5-alpha-reductase, which is the enzyme that converts testosterone into DHT.

Also, women have fewer androgen receptors on the frontal hair follicles; therefore, they are less susceptible to the effects of the DHT that is present. Finally, the enzyme aromatase is found in much higher concentrations in women's hairlines; this important enzyme converts testosterone to estrogens (just as 5-alpha-reductase converts it to DHT), and estrogens are not likely to contribute to hair loss.

Another distinguishing characteristic is that women have a tendency to have more widespread hair loss than men. In addition, females loss is often more gradual, whereas men may begin to rapidly lose hair in their late 'teens or early twenties. Despite these statements, it is significant that men may lose hair in a predominantly "female" pattern, just as women may experience alopecia in what is considered a typically "male" fashion. We will examine these patterns more closely in the next section.

Systemic disease (affecting the entire system) and certain medications can also lead to hair loss in women, and this is notably more common than in men, probably in part due to the aforementioned sensitivity of female follicles to stress. Some of the disease states that may affect female hair loss include: thyroid disease, anemia, endocrine (hormonal) disorders leading to elevated levels of androgens (ovarian cysts or tumors, adrenal or pituitary disease), and connective tissue diseases (lupus, dermatomyositis). In addition, various stressors, such as physical or emotional trauma, surgery, childbirth, general anesthesia, or extreme diets may precipitate differing degrees of hair loss. In some cases, the hair loss is reversible when the disease state is treated, or when the trauma or stress has resolved. However, it may take a year or more for an acute effluvium (hair shedding) to resolve to the point that the cosmetic deficiency is overcome.

This last point deserves elaboration, in terms of the actual process of hair transplantation. When women undergo surgical hair restoration, they are more likely to experience "shock loss" or telogen effluvium. Also, women's hairstyles tend to be longer than men's, especially today. Therefore, it may require more time for growth of new grafts to "catch up" with existing hair, so that a cosmetic difference can be appreciated. These two factors make it crucial that the education process of the patient is complete and well

understood, so that discouragement and dissatisfaction are less likely during what may be a prolonged “interim period”.

Medications known to cause alopecia include certain birth control pills, the blood thinner Coumadin, thyroid hormone, some blood pressure medicines, corticosteroids, high-dose vitamin A, and many drugs of abuse (amphetamine, cocaine, narcotics). It is vitally important for any woman experiencing hair loss to discuss her medical history, in detail, and any drugs or medications she is using. If there is a treatable disease, or a medication that may be discontinued, hair growth may resume. Although significant time may pass after treating the illness or stopping the drug before hair re-growth occurs, it is important to establish a diagnosis before ever considering surgical hair restoration.

A third general cause of hair loss in women is known as “traction alopecia”. This name comes from the precipitating factor of constant traction, or pulling, tugging or mechanical stress on the hair. It is commonly seen in this country among African-Americans due to the fashion of wearing the hair in tight braids, pigtails, or cornrows. This may also occur with the wearing of hair weaves and other “hair systems”. This variety of hair loss is often permanent, yet very amenable to treatment with transplantation. In addition, a specialized type of traction alopecia is termed “trichotillomania”, which is a form of obsessive-compulsive disorder in which hair loss is the result of constant hair twirling, tugging, and actual pulling out of the hair. Hair transplantation is also very effective in these cases, but only after psychotherapy and antidepressant medications have the condition under prolonged control. Otherwise, the transplanted hair may be subject to the same fate as the hair it replaced!

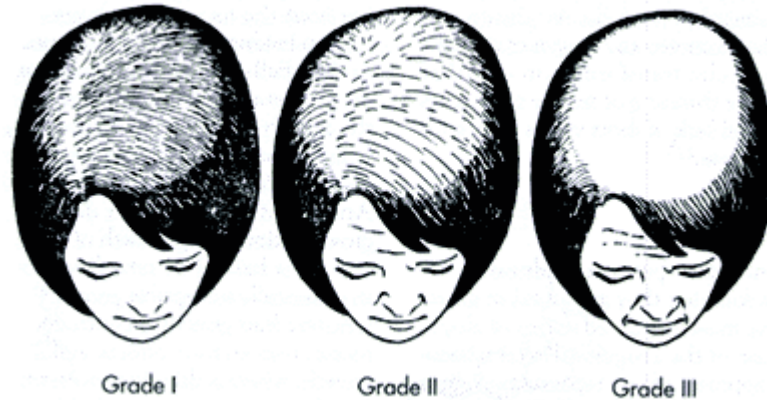
Scarring from trauma (accidental, radiation, burns) or surgery is another common cause of alopecia in women. Burns or surgery to the head and scalp are treatable with follicular unit transplantation in many cases. The residual scarring after facelifts or brow lifts often leave women with hairlines that are less than ideal, especially around the temples and ears. These scars can be transplanted, returning the soft, feathery hairline, and achieving a more natural and aesthetically pleasing state.

Finally, some of the non-scarring localized alopecias may occur. Alopecia areata is typical of these types. It is characterized by sudden loss of hair in patches on the scalp, in which the skin is normal. This type of hair loss may be successfully treated with injections of cortisone-like drugs.

### Patterns of Women’s Hair Loss

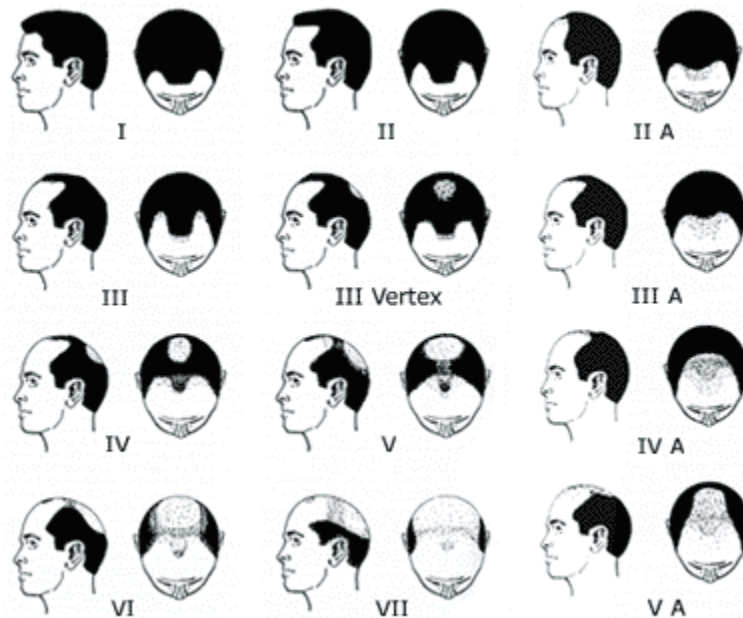
Androgenetic hair loss occurs more frequently in women than any other type of hair loss. However the pattern is more often of the Ludwig variety (figure 1) than of the typical male Norwood type. In the Ludwig classification, the frontal

hairline is preserved, and the thinning is usually centrally located, running from front to back. In the case of Grade I or II balding, transplantation may be quite successful in adding density; women's styling options are more varied than men's, and they may obtain excellent coverage from artistically applied grafting.



**Figure 6**

In more unusual cases, the pattern is similar to the Norwood classifications (figure 2), with the frontal-temporal recessions we are used to seeing in men. Bear in mind, however, that either pattern may occur with either gender, and is not absolutely identified with one or the other.



**Figure 7**

In either case, it is crucial that other medical problems be ruled out, as was detailed in the section on causative factors. Once this is accomplished, the donor area, as well as the balding regions, must be checked for signs of miniaturization. If there is evidence of widespread or diffuse hair loss, the patient may not be a transplant candidate.

In fact, diffuse hair loss has been classified into two subcategories: Diffuse Patterned Alopecia (DPA) and Diffuse Un-Patterned Alopecia (DUPA). These are both felt to be variants on Androgenetic Alopecia, and may occur in males as well. The difference between the two may have great significance to the hair transplant surgeon.

DPA is quite similar to typical Norwood type “male” pattern baldness, except that the affected areas become very thin, but not completely bald. The donor area is spared, and, because of this, the patient may be a candidate for transplantation. On the other hand, DUPA essentially affects the entire scalp, including, of course, the donor area; this would preclude using unstable donor zone hair for grafting. In circumstances such as these, the patient, regrettably, must be counseled about hair systems, wigs, camouflages, and other non-surgical methods of disguising the alopecia. Transplanting a patient with an unstable donor zone, regardless of their desires, amounts to the unethical practice of medicine.

So we see now that a large percentage of the balding or thinning population, that is, women, are unaware or ignorant of some of the options that await them in their struggle with hair loss. As we have shown, there are more possible etiologies (causes) of balding in women than in men; the reversible ones must be ruled out. Also, the hair, like the skin as a whole, may be a “window” to the internal health of many women, and deserves due attention. Various laboratory and blood tests are available to help with establishing a diagnosis, as are specialist consults if necessary. When an identification of the cause is determined, the patient and the hair restoration specialist may go forward in deciding the best course of action for the specific problem at hand.

# Chapter Seventeen

## The Patient's Perspective: From the Chair

Well, you may ask yourself, why have they written about the patient's perspective? I'll find out exactly what that is myself, if I decide to have a hair transplant; I'll be in the chair myself, experiencing it first hand. I don't need anyone else to interpret this event for me.

Our feeling is that "forewarned is forearmed". After all, this book is entitled, "Patient Guide to Medical and Surgical Hair Restoration". So we wish to guide you on what amounts to a significant journey in your total life experience. We have spent much time discussing the significance of hair and the balding process, the indications for follicular unit transplantation, the nuts and bolts of the procedure itself, and how it is carried out in various situations and in different areas of the scalp. However, if you decide to actually undergo the surgery, the fewer surprises, the better. Until you are actually in the chair, having the procedure, your understanding of the experience will be, to some extent, incomplete.

This is where our collective experience may be of help. Even a hair transplant surgeon cannot fully grasp the subjective sensations of being "on the receiving end" unless they have. Some of us, however, have done both; our experiences both in the chair and out of it, may be invaluable in preparing and reassuring you, the patient, so that your experience of the procedure can be as pleasant and positive as possible.

First of all, it is natural and understandable for any person undergoing hair transplant surgery to feel somewhat conflicted, to have some slight misgivings, even if we find it hard to admit it to ourselves. I know I did. After all, we are spending significant money, and no matter how well prepared we are, a part of us is unsure what the outcome will be (although we've been told the result is forever!) Follicular unit transplantation is definitely not for those who require immediate gratification. It may be as much as a year before we see the full cosmetic effect of the surgery.

There may also be some degree of fear regarding the surgery itself. Some people, like myself, have minimal concern about the actual procedure. Others, however, may have ingrained memories from childhood, or from other surgeries, that grant them a great deal of anxiety in dealing with just about any medical procedure. The sense of being "in control" is very important to some patients, and giving over their well-being to others, even briefly, brings on a feeling of vulnerability.

This sense of vulnerability, however, may stem from many other potential factors. For one, although we are in some ways the center of attention, we may at times feel ignored. We may not know the staff as well as we do the

doctor, and we sometimes hear strange and unfamiliar terminology being used. At intervals, such as during the creation of graft sites, silence may be necessary, and the normally chatty staff may become mute. We may be sedated, which can be helpful, but feeling a little “foggy”, being unable to see what is going on, and experiencing unfamiliar sensations may add to this impression of vulnerability.

Many people being treated by a hair restoration specialist also have issues with privacy, and a desire to have no one else know they are being transplanted. They may obsess about how they will appear after the procedure, and be concerned with being “discovered” or appearing foolish in some way. This may be due to perceived societal stigmas regarding “vanity”, or “superficiality”. These are concerns we all must deal with in our own way (I certainly did!) There is certainly no harm in wanting to improve one’s appearance; almost all people take steps to do so on a daily basis.

Moreover, it really is no one else’s business what we are doing for ourselves. The staff and physician are bound to rules and laws of confidentiality, and are most supportive of your efforts to improve your quality of life. This knowledge alone goes a long way toward calming any fears patients have; also, the presence of a supportive spouse or friend before and after the surgery is a great comfort.

## Chapter Eighteen

### Making Informed Choices (About a Life-Long Decision)

Deciding to use medical and/or surgical hair restoration techniques is indeed a life-long choice. At least with the medicines available today, continued use is required to maintain the benefits. Surgery, whether it is scalp reduction, flaps, older styles of transplantation, or state of the art follicular unit transplantation, will produce results, for better or for worse, which will persist for a lifetime. Therefore, this is a decision to be entered into thoughtfully, reasonably and with a working knowledge of the procedures and of the possible pitfalls. To assist you in this informed decision-making is the major purpose of this manuscript.

So let us revisit for a moment some of the salient points that have been made thus far. First of all, there is the significance of hair itself. Hair, or its absence, has been historically, and continues to be, of singular importance, culturally and individually. Like it or not, hair and hair styling speak volumes about our tastes, our station in life, and our attitudes. Hair loss may have a powerful affect on how we are seen and potentially how we feel about ourselves. Although some may see this as indicative of a current cultural vanity or superficiality, an interest in, if not an obsession with hair has existed for millennia.

We have learned that hair grows as thick, strong terminal hairs and also as soft, fine vellus hairs; also important is the concept of the stages of growth: anagen (active), catagen (transitional) and telogen (resting). We now recognize that hair is grouped together as “follicular units” of one, two, three, or more terminal hairs, along with vital supportive structures. Transplanting these single follicular units is recognized as the state of the art in current hair restoration surgery.

Remember that the cause of balding in men and in women is most often what we term androgenetic alopecia: this simply means that, in someone genetically predisposed, the effects of androgenic hormones (especially dihydrotestosterone, or DHT) over time lead to the process of miniaturization. It is this miniaturizing of the normally robust terminal hairs that leads to the condition we define as baldness, or thinning. The fine, short, less pigmented (vellus) hairs that remain are inadequate to provide the scalp coverage necessary to block light. It is this light shining on the scalp that causes the appearance of balding. In addition, the anagen, or growth phase of the hair, becomes progressively shorter, until eventually the hairs are lost for good. It is important to note, that at this point our current medications for hair loss will no longer be of assistance in preserving hair. These drugs are only useful in slowing or reversing the miniaturization process.

Useful tools for patients and physicians in staging the balding process are the Norwood and Ludwig classifications. These are “typical” patterns of male and

female hair loss, respectively, but are only guidelines. They allow us to “speak the same language” when discussing balding patterns. Remember, however, that it is difficult or impossible to accurately predict the eventual progression of hair loss in any individual. Thus, it is usually crucial, especially in younger men, to assume that the pattern will at some point progress to its ultimate conclusion (in other words, to a Class VII, or complete baldness). This awareness is also invaluable in helping the hair transplant candidate develop realistic goals for hair restoration, so that the result can stand the tests of time and of continued hair loss. A true value is achieved if the surgical product is aesthetically appropriate not only at an earlier age, but also as the person continues to age.

There exist various medical, surgical and prosthetic remedies for hair loss. No one method is right for everyone. Wigs, or “hair systems”, for example, may be the only option for the individual with very advanced balding and minimal donor hair available. These hair systems are manufactured in a wide variety of styles and attachment modes; they may be cheaply mass-produced, or custom made, with great care and a correspondingly high price. Many people think that a hairpiece or weave will be much less expensive than surgical hair transplantation. On further consideration, however, we realize the following: hair transplantation is naturally growing hair that persists for life, and may possibly require a single procedure only. Hairpieces, on the other hand, wear out and must be periodically replaced. In addition, two must usually be purchased, and regular maintenance is a feature of almost every type of hair system. The fees for this routine maintenance add up, and over the lifetime of the individual, can entail more financial investment than a surgical procedure! There are also some types of systems that may actually accelerate the process of hair loss.

There are as many “cures” and treatments for hair loss in the marketplace as there are entrepreneurs. Unfortunately, despite all the testimonials and “before and after” photos, none of them have been shown to work. Non-drug therapies are not under the aegis of the Food and Drug Administration (FDA), and therefore can make claims that may not be based on controlled scientific trials. Drugs, however, are required to pass rigorous testing for safety and effectiveness under the auspices of the FDA, and we currently have two such agents available: minoxidil (Rogaine) and finasteride (Propecia). These drugs will not re-grow hair where none exists, but they may slow or even reverse the miniaturization of terminal hairs in some people.

Like any drug, these two medications may cause side effects, although at this point they are both felt to be fairly safe. One drawback to their use is that the benefits are reversible. In other words, any advantage gained from using the drugs is lost with in a few months of stopping the medications. Also, they do not work for everyone, and their effects are generally more pronounced in the

back of the head, rather than in the frontal or hairline area, which is usually more cosmetically important than the crown.

The art of surgical hair restoration has been widely practiced in the United States for about four decades, but it could be said that many of the major innovations in the field have largely taken place only during the past ten years. Throughout the decade of the 1990's, older, more invasive procedures such as flaps, scalp lifts, and scalp reductions were abandoned by many. At the same time, cutting-edge hair surgeons began advocating follicular unit transplantation as the state of the art, along with its associated techniques of single strip donor harvesting, stereomicroscopic graft dissection, and, often, large sessions of a thousand or more grafts. A desire to preserve as much of the precious donor hair as possible for the future led to a new focus on the donor area; also, the development of new techniques for decreasing trauma to the recipient sites produced quicker healing, and less postoperative "detectability".

We have discussed at length the different regions of the scalp, and their varying importance in terms of the hair restoration process. The hairline and frontal area are usually of paramount consideration, because of the aesthetic impact of "framing the face". The crown, on the other hand, may be of somewhat less significance, as well as being an area that may consume vast quantities of donor hair for a minimal cosmetic impact. Again, the importance of long term planning cannot be overstated. The patient's hair density, hair characteristics (color, curl, caliber), age, degree and type of hair loss, previous procedures, potential for "shock loss" (telogen effluvium), and budget all play a role in determining the eventual outcome of the transplant.

Another oft-neglected topic is the suitability of women for hair transplant surgery. Interestingly, although a large percentage of the balding population is female, only a small, albeit growing, number of the hair transplants performed yearly involve women. The reasons for this are varied. Many women have no idea that they may be candidates. Also, women's hair loss is often more diagnostically complex than men's, and a number of other disease processes may need to be ruled out. Be that as it may, we do know that hair loss may be even more emotionally devastating for women than it is for men.

Also significant, for either gender, is the decision to have a second or subsequent procedure. These can be undertaken for a variety of reasons. One is to refine or lower the hairline, and another is to increase fullness or density. Crown restoration is also a consideration. An often-unforeseeable occurrence is simply the progression of the patient's hair loss; this may happen rapidly, or advance slowly over years or decades.

The concept of long term planning will be an obvious priority to the kind of surgeon you will want to work with. As we have stated before, technical expertise is mandatory, but is not enough. Your hair transplant surgeon must

also have the aesthetic, visionary, and ethical qualities to help you make the correct, sober and realistic decisions that will be necessary for an optimal outcome. Does he discuss with you the cosmetic impact of planned procedures? Is there a concern not only for the immediate future, but also for the transplant you will be wearing for life? Is he willing to tell you what you may not want to hear about your hair characteristics, donor density, pattern of balding, and other factors which must be taken into account? And does he have the courage to postpone your surgery, or even refuse it, if that is truly in your best interests?

These are questions that will cast a light on the moral, technical, and artistic character traits of the person in whom you are placing your trust. These decisions are not always easy ones. Ask the questions, but also learn to trust your instincts, or your “gut” feelings. If you respect your physician’s character and motives, then allow him to counsel you. He will help you come to a reasonable conclusion. Remember, as you go forward with your plan, that a sense of trust will alleviate your anxiety about the surgery, as well as improving your level of confidence. Taking such a step toward boosting your self-esteem and refining your image is most ideally undertaken with poise, enthusiasm, and great optimism. Indeed, the hair transplant experience could be the most profound step you ever take in advancing your physical appearance and emotional wellbeing. Enjoy it!

## BIOS



**John P. Cole, MD** practices in Atlanta, Georgia, and Cyprus in Europe. Seminars are taking place in NY, Washington, DC, Chicago and London.

Dr. Cole attended Mercer University on an academic scholarship from the United States Army and graduated summa cum laude with a degree in biology in 1981. He continued on to the Medical College of Georgia, where he received his medical degree in 1985.

Dr. Cole completed his postgraduate medical training at the University of Missouri in the field of internal medicine. He has dedicated his practice solely to the field of hair

transplant surgery since 1990. He has maintained a private practice in hair restoration since that time. He is a member of the International Society of Hair Restoration Surgery, the American Society of Hair Restoration Surgery and the American Academy of Cosmetic Surgery. Dr. Cole was among the first thirty physicians to become a Diplomat of the American Board of Hair Restoration Surgery.

He serves on the Board of Directors and examination committee for the American Board of Hair Restoration Surgery. In the interest of sharing his knowledge to improve the field of hair transplantation, Dr. Cole has written and presented many papers, both to hair transplantation societies and at educational seminars. He maintains a keen interest in development of instruments to refine hair transplantation procedures, creative research in follicular anatomy, and has developed mathematical formulas to accurately measure human performance in hair restoration surgery.

In 1999, Dr. Cole was awarded a research grant from the International Society of Hair Restoration Surgery for his work on regional variation in hair diameter and hair density. He presented the current findings from this research at the 2000 meeting of the International Society of Hair Restoration Surgery. In December 2000, Dr. Cole orchestrated the Beginner's Program at the International Society of Hair Restoration's Annual Medical Conference in Hawaii, whereby he trained over 75 physicians in the processes and techniques of hair transplantation. Dr. Cole is an invited speaker to the first Korean Workshop on Hair Restoration, the 2001 European Society of Hair Restoration Surgery in Barcelona, and the 2001 Italian Society of Hair Restoration Surgery meeting in Sicily.

Dr. Cole will function as Co-chair at the Aegean meeting of hair restoration surgery in Athens, Greece this year. At the 2000 International Society of

Hair Restoration Surgery meeting Dr. Cole was awarded First Place by the International Society of Hair Restoration for his poster presentation entitled, "Computer Applications in Hair Transplantation." He was named to the Research Committee of the International Society of Hair Restoration Surgery in 1999.

Dr. Cole will function as director of the Beginners Program at the International Society Meeting of Hair Restoration Surgery meeting in Puerto Vallarta, Mexico. He is in charge of the audio-visual committee of the ISHRS meeting in Puerto, Vallarta He will speak at the 2003 annual meeting of the American Academy of Dermatology in San Francisco on the subject of donor harvesting and management along with a select group consisting of only four other physicians His most recent scientific project is developing improved optics for the dissection and harvesting of white hairs using physics and lasers His most recent inventions include a follicle cutting board with fiber optic back lighting He is presently working on a recipient site counting device and a computerized fluid dynamic anesthesia delivery machine

Dr. Cole has invented several other instruments to improve the speed and efficiency of hair restoration surgery These include instruments to harvest the donor region, instruments to prepare the recipient sites, and most recently a slivering board to assist in the preparation of thin strips of donor tissue over 1 cm in length and 1 mm wide This slivering board is transparent and allows for both top and bottom lighting The combination of both improves visualization of the grafts and decreases trauma to the individual hairs The production of thin slivers speeds the production of grafts, at a rate often exceeding 450 per hour, with minimal damage to the hairs His latest inventions include a fiber optic back lighting system that allows visualization through the tissue so that all hairs are easily distinguished, a new anesthesia delivery system, a new recipient site instrument, a new ergonomic microscope base, a voice activated computerized graft counting system, and a suction device to assist in the production of recipient sites under a clean field

#### Media:

Dr. Cole has many appearances and interviews by local stations and national publications These include a local CBS TV interview in 1992, live radio interview regarding propecia in 1998, plastic surgery television interview in 1999, and an interview by Cosmetic Surgery Times in 1998.

Teaching: ISHRS Beginners course 98, 99, 2000, 2001 Italy 1997 beginners course European 2001 Beginners course Korean Live surgery workshop 2001 Numerous physicians have traveled from Europe and the middle east to learn hair restoration surgery from Dr. Cole Dr. Cole served as the surgery research coordinator in Orlando, FL for the International

Society of Hair Restoration Live Surgery Workshop in 2002 Dr. Cole is currently involved in teaching the training Fellow physicians for Medical Hair Restoration

#### Articles:

Several in Forum on nomenclature, the use of trigonometry to accurately calculate the donor harvest, how to estimate the recipient area, how to estimate the size and number of follicular units, how to maximize donor yield, how to measure the distance between the grafts based on the density and the pattern of distribution, how to predict coverage, and predicted yield. The chapter on Donor Harvesting for Walter Unger's new text is authored by Dr. Cole A featured article in Cosmetic Surgery Times on Donor Harvesting in 1998

#### Awards

1999 ISHRS Research Grant for his study on Regional Variation in Hair, 2001 Archimedes Award by the Italian Society of Hair Restoration Surgery, 2002 Michelangelo Award for Elegance and Energy, 2002 DHI 30 Year Anniversary Award for his contribution to hair research and the Aegean Masters Hair Restoration Surgery Meeting

#### Presentations:

Maximizing Donor yield, donor harvesting, mathematics of follicular transplantation, microscope vs loops comparison, etiology of hair loss, mustache transplantation, the metamorphic changes to surgically excised hairs, biological switches, and the physics of light Numerous seminars across the United States on the cause and treatment of androgenic alopecia to the lay public

Dr. Cole's other interests include computers, electronics, flying, snowboarding, water skiing, baseball wake boarding, golf, dressage, and raising his children



**Dr Paul T Rose, MD** is a graduate of the University of Buffalo where he received a BA in Biology. He went on to Cornell University-New York Medical Center where he worked as a research assistant in virology.

Dr Rose then attended the State University of New York Downstate Medical Center and received his MD degree. While at Downstate Medical Center he did research on T and B cell homing mechanisms in lymph nodes. During medical school he was selected for an elective at the National Institute of Health, Rheumatology Section and a research elective in the Department of Allergy and Immunology at Good Samaritan Hospital, an affiliate of the Johns Hopkins University School of Medicine.

After medical school Dr Rose completed an internship in internal medicine at the University of Connecticut Medical Center. He went on to practice Emergency Medicine in the Tampa Bay area of Florida for almost five years. He then completed a residency in dermatology at Temple University Skin and Cancer Hospital in Philadelphia, Pennsylvania in 1988. While in the dermatology program Dr Rose began his experience in hair replacement surgery.

Subsequently Dr Rose entered private practice in Dermatology, establishing his own practice in 1991 in Tampa and New Port Richey, Florida. He has specialized in dermatologic cosmetic surgery as well as skin cancer surgery and reconstruction. He has been particularly recognized for his work in hair replacement surgery, liposuction and laser surgery.

Dr Rose is on the teaching faculty of the University of South Florida, Department of Medicine-Dermatology Section and is involved with instructing residents in various aspects of dermatologic surgery.

Dr Rose is internationally recognized in the field of hair replacement. Over the years he has presented numerous lectures around the world and has demonstrated the surgical techniques of follicular unit grafting.

Dr Rose has written a chapter on scalp surgery in the dermatology textbook titled Principles and Techniques of Cutaneous Surgery. He has written various articles in hair replacement, published in several peer-reviewed journals. Dr Rose has had a particular interest in studying the factors that contribute to establishing the most natural hairline appearance.

Dr Rose along with several other physicians such as Bob Limmer, Ron Shapiro, Bob Bernstein, Bill Rassman, David Seager , Carlos Uebell and John Cole helped develop the concepts and techniques of “mega session “ grafting and follicular unit transplantation.

Most recently Dr Rose contributed to several chapters of the latest edition of the textbook Hair Transplantation.

As part of his ongoing interest to contributing to the field of hair replacement Dr Rose has served as the Director of the Beginner’s Course for the International Society of Hair Replacement Surgeons and in 2000 he served as Chairman of the Scientific Program for the annual ISHRS meeting. For the past several years he has been a member of the Scientific Committee and the Live Surgery Workshop Committee for the ISHRS.

Dr Rose serves on the Board of Governors of the ISHRS and is chairman of the Pro Bon Committee of the ISHRS, which is dedicated to providing hair replacement for indigent individuals who have been the victims of trauma or disease.

Dr Rose has been the recipient of an award for the Best Tip for Hair Replacement Surgery. This was a poster presentation regarding creating a natural hairline. In 2002 he was a recipient of the Michelangelo Award from the Italian Society of Hair Restoration.

Dr Rose has also been an invited faculty member to the Orlando Live Surgery Workshops sponsored by the ISHRS. He has demonstrated the technique of follicular unit grafting and has lectured on various topics such as hairline creation and backlighting. He has been involved in several clinical research projects performed at the live surgery workshops and the data has been presented at ISHRS and European Society meetings. He has also been invited to speak for Pharmacia on the subjects of medical therapies for hair loss and the use of medications for hair loss in women.

Dr Rose has been elected to the Board of Governors of the International Society of Cosmetic Laser Surgeons and has served as course director for Botox courses offered by the society.

Dr Rose has also had an interest in basic science and is actively involved in research studying the role of apoptosis (controlled cell death) in male pattern alopecia. He has collaborated with Dr Michael Morgan at the University of South Florida in this project.

Dr Rose is recognized for developing the concept of backlighting and some of the devices used for this purpose. He has also invented the micrograft

facilitator.

Dr Rose's outside interests include music (he an avid guitar player and songwriter), skiing, tennis and golf.



Georgia War Veterans Nursing Home of MCG, 1974-76

ICU/CCU Doctor's Hospital Augusta, 1978-1981

Talbott-Marsh Recovery Center/Anchor Hospital, 1988-90  
(Director: Mirror Image Placement; Director: Aftercare  
for Impaired Health Professionals Program),  
(Clinical Fellowship: Addiction Medicine)

Private Practice Anesthesiology and Pain Management,  
Columbia Parkway Hospital, 1993-95

1995 to present: Solo private practice, specializing in Medical Acupuncture,  
Holistic and Interventional Pain Management, and Complementary  
Medicine

## PROFESSIONAL

Medical License: State of Georgia, #32520

Board certification: American Board of Anesthesiology, #24345

Diplomate: American Board of Anesthesiology

Diplomate: American Academy of Pain Management

Diplomate: American Academy of Medical Acupuncture

Certified: American Society of Addiction Medicine

Member: American College for Advancement in Medicine

Member: American Association of Orthopaedic Medicine

Founding President: Georgia Association of Medical Acupuncture

## PUBLICATIONS AND PRESENTATIONS

"Grand Rounds: Treatment of Impaired Physicians." Department  
of Internal Medicine, Emory University School of Medicine,  
May 18, 1989, Atlanta, GA.

"Personal and Professional Perspective." Massachusetts  
Medical Society Conference on Chemical Dependency,  
June 15, 1989, Boston, MA.

"Grand Rounds: Addictive Disease in Medicine." Department of

Surgery, Medical College of Georgia, July 22, 1989, Augusta, GA.

"Treating Addicted Health Professionals." Department of Counseling Psychology, Georgia State University School of Graduate Studies, July 19, 1989, Atlanta, GA.

Talbott, G.D., Bridges, M.T.: Mirror-Image Therapy - A Treatment Modality for Impaired Health Professionals. American Medical Society on Alcoholism and Other Drug Dependencies Medical-Scientific Conference, April 1989, Atlanta, GA. (Abstract)

Bridges, M.T., Martin, D.C., Aronstam, R.: Volatile Anesthetics Disrupt Glutamate-Stimulated (3H)MK-801 Binding to the Ionophore of N-methyl-D-Aspartate Receptors. (Abstract)

Chiple, P.S., Bridges, M.T., Castresana, M.: Prolonged Use of an Endotracheal Tube Changer in a Pediatric Patient with a Potentially Compromised Airway. Chest, June, 1993.

Robert P.S. Introna, M. Truett Bridges, Jr., et al: "Direct Effects of Fentanyl on Canine Coronary Artery Rings" Life Sciences, Vol. 56, No. 15, pp. 1265-1273, 1995.

"Medical Acupuncture." Northside Hospital Wellness Committee. Atlanta, Ga. June 26, 1997.

"Medical Acupuncture." Evenings at Emory Program, Emory University, Atlanta, Ga. July 16, 1997; 1998

"Acupuncture." Department of Internal Medicine, Div. of General Medicine, Emory University, Atlanta, Ga. December 11, 1997; 1998

"Peristalsis" appeared in Southern Poetry Review, Winter, 1996 issue. (Poem)

Bridges, M. Truett Jr: "Multimodal Management of a Patient with Metastatic Disease Undergoing Chemotherapy" Medical Acupuncture, Vol. 10, No 1, Spring/Summer 1998.

Bridges, M. Truett Jr: "Acupuncture Management of Osteoporotic Fracture Pain" Medical Acupuncture, Vol. 10, No 1, Spring/Summer 1998.

Bridges, M. Truett Jr: "Combined Allopathic and Acupuncture Management of Post-Herpetic Neuralgia of Sacral Distribution" Medical Acupuncture, Vol. 10, No 1, Spring/Summer 1998.

## AWARDS AND ACHIEVEMENTS

First Prize for the presentation "Volatile Anesthetics and NMDA Receptors."

Gulf Atlantic Anesthesia Residents Conference. Tulane University School of Medicine, May 24, 1992, New Orleans, LA.

Robert D. Dripps, M.D. Memorial Award: Outstanding Graduate Resident in Anesthesiology. Medical College of Georgia, June, 1993.

Volunteer Work: General Practice, Muktanada Mobile Hospital, Maharashtra Province, India, 1988-89.

Volunteer Physician: Beulah Land Natural Medicine Free Clinic, Thebes Illinois, January, 2000.

Volunteer Physician: Beulah Land Natural Medicine Free Clinic, Thebes Illinois, January, 2001.

Physician Preceptor, UCLA Medical Acupuncture Course, Atlanta, Georgia, March 30th – April 1st, 2001

Physician Preceptor, UCLA Medical Acupuncture Course, Boca Raton, Florida, October 26th-30th, 2001

Physician Preceptor, UCLA Medical Acupuncture Course, Boca Raton, Florida, April 18th-21st, 2002

## RECENT MEDICAL EDUCATION

"Seropositive Patient" Medical Education Collaborative, Feb. 10, 1997. Category One: 1 hr

"Pain Management Issues in Patients with HIV Disease" Cedars-Sinai Medical Center. Sept. 4, 1997. 2 hrs

"The Southeast Conference on Alcohol and Drug Abuse" Medical College of Georgia, Dec. 3-6, 1997. 22.0 hrs

"Medical Acupuncture for Physicians" Nov. 21-24, 1996; March 14-23, 1997. UCLA School of Medicine, 200 hrs

"Energetic and Physiologic Basics of Acupuncture" Maricopa Medical

Center and AAMA, May 30- June 1, 1997. 22 hrs

“Principles of Acupuncture in Pain Management” Maricopa Medical Center and AAMA, April 2, 1998. 7.5 hrs

“The Diversity of Acupuncture: Local and Distant Treatment Strategies” Maricopa Medical Center and AAMA, April 2-5, 1998. 22 hrs

“Smoking Cessation: Counseling in the Office Setting” Boston University School of Medicine, May 20, 1998. 1 hr

“Addiction Medicine Review Course 1998: A Comprehensive Overview of the Diagnosis and Management of Substance Abuse Disorders” California Society of Addiction Medicine, Oct. 7-10, 1998. 29 hrs

“Great Lakes College of Clinical Medicine” Workshop, March 12-14, 1999. 12.25 hrs

“Introduction to Yamamoto New Scalp Acupuncture” Maricopa Medical Center and AAMA, April 8, 1999. 7.5 hrs

“Controversies in Acupuncture” Maricopa Medical Center and AAMA, April 8-11, 1999. 22 hrs

“Autonomic Response Testing” American Academy of Neural Therapy, May 28-30, 1999. 19 hrs

“Confronting Aging and Disease: The Role of HRT” Medical Education Collaborative, Oct. 23, 1999. 1 hr

“Recent Advances in the Treatment of Myofascial Pain Syndrome” Dannemiller Memorial Educational Foundation, Oct. 25, 1999. 1 hr

“Anatomy, Diagnosis, and Treatment of Chronic Myofascial Pain with Prolotherapy”, University of Wisconsin Medical School, Oct. 27-30, 1999. 23 hrs

“Integrative Medicine in the New Millennium” Great Lakes College of Clinical Medicine, Feb. 25-27, 2000. 18 hrs

“Unveiling the Mysteries of Acupuncture: Energetics, Myofascia and Neurophysiology”, Maricopa Integrated Health System and AAMA, April 27-30, 2000. 22 hrs

“Treatment of Malignant and Non-Malignant Pain”, Maricopa Integrated Health System and AAMA, April 27, 2000. 7½ hrs

“Basics in Orthopedic Medicine”, St. Joseph Hospital, Tucson, Arizona and the Carondelet CME, September 21-24, 2000. 24 ½ hrs

“Medical Challenges for the Family”, ACAM, SaltLake City, Utah, October 26-29, 2000. 17 hrs

“Shaping the Future of Medicine”, 13th Annual Symposium, American Academy of Medical Acupuncture, March 23rd –25th, 2001. 22 hrs

“Evaluation and Treatment of Upper Body Pain and Dysfunction”, 18th Annual Meeting of the American Association of Orthopaedic Medicine, April 25th –28th, 2001. 24 hrs

Rotating Advanced Clinical Workshop: Clinical Skills for Preceptors. UCLA School of Medicine, Winter/Spring 2002, 44 hours

“Medical Acupuncture: Embracing Science and Tradition” 14th Annual Symposium, American Academy of Medical Acupuncture, Los Angeles, CA, April 19-21, 2002, 22 hours