

## Facts About Hair, Hair Loss and Hair Loss Treatments

### Facts About Hair

As far as we know, the most important function of scalp hair today is its role in social relationships. Well-groomed hair is an asset in our personal lives, in our jobs, and in helping us feel good about ourselves. Less important today is the role of hair in protecting the scalp against physical injury, heat loss in winter and damage from solar radiation in summer—we have headgear for this kind of protection.

Of the approximately five million hair follicles on the human body, 100,000 to 150,000 are on the scalp when the scalp is unaffected by hair loss. The number of scalp hair follicles is linked to hair color: the greatest number of scalp hair follicles is found in blonds, fewer in brunettes, and the least number in people with red hair.

### The Hair Growth Cycle

The normal growth rate of scalp hair is one-fourth to one-half inch per month. Hair growth has a cyclic pattern that can be affected by a number of genetic, disease, medication or other factors to cause hair loss.

Hair is formed in the hair follicle and grows out of the follicle in a continuous cyclic pattern of growth and rest. There are three phases in the hair growth cycle:

- Anagen—growth phase, 2 to 8 years;
- Catagen—degeneration phase, 2 to 4 weeks; and,
- Telogen—resting phase, 2 to 4 months.

During anagen the follicle actively grows hair.

During catagen the follicle is almost entirely degraded.

During telogen the follicle rests prior to re-initiation of an anagen phase and the growth of a new hair shaft.

As the new hair shaft emerges it pushes out the prior “dead” hair shaft, and the old hair is shed. About 50 to 100 telogen hairs are normally shed every day; these are the hairs we find in our comb, brush and shower drain. About 10 percent of scalp hair follicles are normally in telogen phase at any given time if the scalp is healthy and not affected by any condition that causes hair loss.

### Hormones: Key Factors in Hair Growth and in Male and Female Pattern Hair Loss

The hormones called androgens are important control factors in hair growth and in inherited male and female patterns of hair loss. The androgen hormone testosterone and its metabolite dihydrotestosterone (DHT) are the key control factors:

- Testosterone is a key control factor in the growth of beard, underarm and pubic hair.

- Scalp hair growth is not under androgen control, but scalp hair loss is associated with presence of DHT in male and female pattern hair loss. DHT plus the presence and activity of hair loss gene(s) are the key factors underlying male and female pattern hair loss.

### Genes: The Other Key Factor in Male and Female Pattern Hair Loss

Male and female pattern hair loss is called androgenetic alopecia (AGA) because both androgens (andro) and genes (genetic) are involved. Alopecia is a medical term for hair loss.

Androgenetic alopecia (AGA) “runs in families”. It is an inherited condition associated with a gene (or genes). Both the testosterone metabolite DHT and the gene for hair loss must be present for AGA to occur. The gene for hair loss makes scalp hair follicles extraordinarily sensitive to DHT, and this sensitivity eventually causes hair follicles to (1) stop producing hair, or (2) produce only miniaturized “peach fuzz” hair. The amount of DHT does not need to be greater than normal for AGA to occur; it is the presence of the gene for AGA that causes DHT to halt growth in hair follicles.

Patterns of inheritance of the hair-loss gene can be unpredictable for the average person. Having a father or uncle with AGA makes it probable—but not certain—that AGA will occur in a son or daughter. Physician hair restoration specialists are familiar with the genetics of AGA and can usually counsel a patient regarding the onset and progression of male or female pattern hair loss.

### Male Pattern Hair Loss

Androgenetic alopecia (AGA), also known as male pattern hair loss, is one of the most common conditions affecting men. In the United States, 35 million to 40 million men are affected by AGA. In some men AGA progresses to baldness over most of the scalp. Degrees of hair loss range from this most severe form of AGA to the least noticeable loss of hair in the front temporal area above the eyebrows. Loss of hair in the front temporal area is usually the first place where hair is lost in male AGA; in some men the loss stops there and never progresses while in other men hair loss continues into other areas of the scalp. Progression of hair loss is rapid in some men, slower in others. A physician hair restoration specialist can often predict the final appearance of hair loss based upon the rapidity of onset and progression.

Male AGA occurs in an array of patterns illustrated in the Norwood-Hamilton Scale. The Norwood-Hamilton Scale is used by physician hair restoration specialists in assessing hair loss and in planning hair loss treatment.

The Norwood-Hamilton Scale illustrates a feature of AGA that makes hair transplantation possible: No matter how severe the hair loss, hair is never lost at the back or sides of the head or on the nape of the neck. These regions are under different genetic control from the gene(s) that affect hair follicles at the front and top of the head. This “preserved” hair at the back and sides of the head is a reservoir of healthy follicles that can be harvested and transplanted to scalp areas where hair has been lost.

### Female Pattern Hair Loss

Androgenetic alopecia (AGA) occurs in women as well as in men. In women, AGA is defined as female pattern hair loss. The patterns of AGA in women are significantly different from the AGA patterns in men.

The typical appearance of female pattern hair loss is diffuse thinning of hair over the top of the scalp. The Ludwig Classification illustrates female pattern hair loss in increasing degrees of severity from Grade I and Grade III.

Female pattern hair loss can begin at any age from teen-age through middle age. There may not be an obvious hereditary association; whereas a man with AGA usually has close male relatives with AGA, no such family pattern may be apparent for women.

While AGA is the most common cause of permanent hair loss in women (about 50 percent of women over age 40 have some degree of female pattern hair loss), it is by no means the only cause. Non-AGA causes of hair loss are more frequent in women than in men; some of these causes are discussed in the next section.

Women more than men are also likely to have temporary hair loss that may occur separately or together with female pattern hair loss. Two common causes of temporary hair loss in women are the hormonal changes associated with pregnancy and untreated hypothyroidism.

A woman who is worried about loss of scalp hair should consult a physician hair restoration specialist for evaluation and diagnosis. Female hair loss can usually be successfully treated after a diagnosis is established.

### *Non-AGA Causes of Hair Loss*

While androgenetic alopecia (AGA) is the most common cause of hair loss in both men and women, hair loss can also be due to a number of other conditions. These conditions may not be recognized until they are diagnosed by a physician hair restoration specialist. Successful treatment is dependent on correct diagnosis. Some of the most important of these non-AGA causes of hair loss:

- Alopecia areata—a possibly autoimmune disorder that causes patchy hair loss ranging from diffuse thinning to extensive areas of baldness with islands of retained hair.
- Scarring alopecia—hair loss due to scarring of the scalp. A common cause of scarring alopecia is persistent tight braiding or corn-rowing of scalp hair. Over a period of time scarring may destroy hair follicles and result in permanent hair loss. More severe scarring alopecia may be caused by physical cutting-ripping-tearing injury to scalp skin or burn injury.

- Telogen effluvium—a relatively common type of hair loss caused when a large percentage of scalp hair follicles are shifted into “shedding” phase. An underlying cause may be hormonal, nutritional, or drug-associated.
- Loose-anagen syndrome—a condition that occurs primarily in fair-haired persons. Scalp hair sits loosely in hair follicles and is easily extracted by normal combing or brushing. In some cases the condition appears during childhood and improves in later life.
- Triangular alopecia—a loss of hair in the frontal area of the scalp that sometimes begins in childhood. Hair loss may be complete in the frontal area or a few hairs may remain. The frontal hair loss can look similar to early-stage AGA. The cause of triangular alopecia is not known but it can be successfully treated.
- Trichotillomania—compulsive hair plucking. The condition ranges from idly plucking hair while reading or watching TV to ritualistic plucking of hair in specific patterns. Over time, trichotillomania can cause scarring alopecia and permanent hair loss. Hair loss due to trichotillomania usually cannot be successfully treated until underlying psychological or emotional conditions are treated successfully.
- Scalp infections—bacteria, fungi and viruses can invade and damage hair follicles, causing hair loss. The infection must be diagnosed and treated before hair restoration can be undertaken.

#### Finding Out the Cause of Hair Loss

Trial and error treatment is not the most effective remedy for hair loss. The most effective and successful treatment is based upon a correct diagnosis of the cause of hair loss. The fastest and surest way to obtain a correct diagnosis is to consult a trained and experienced physician hair restoration specialist.

Before recommending or undertaking a surgical hair restoration procedure or non-surgical hair restoration program, the physician hair restoration specialist will conduct a series of tests and examinations that will include at minimum (1) a medical history, (2) a physical examination, and (3) a scalp examination. If those examinations indicate that hair loss may be due to a condition other than male or female pattern hair loss, the physician will look for other causes. In men, the diagnosis of androgenetic alopecia is generally straightforward but in women, determining the exact cause of hair loss can be more complicated. In some cases an underlying condition such as hypothyroidism may have to be treated by the patient’s primary care physician before hair restoration can be undertaken.

A scalp examination to determine the cause and progression of hair loss may include any of the following tests, depending on the physician’s assessment of information needed:

- Hair pull—about 25 to 50 hairs are removed from the scalp by gentle pull. Normally, only a few hairs are removed with each pull; removal of larger numbers with each pull may indicate an abnormality of hair growth. Extracted hair shafts can be examined under a microscope to determine the condition of the hair shaft and bulb (the end of the hair shaft extracted from the follicle).

- Phototrichogram—hairs are clipped or shaved in a marked-out area of the scalp and consecutive photographs taken over three to five days to determine the rate and quality of hair growth.
- Hair window—hairs are clipped or shaved in a marked-out area of the scalp and hair growth is evaluated over a period of 30 days. Abnormalities of hair growth cycling can indicate an underlying condition such as thyroid hormone imbalance, nutritional deficiency, drug side effect, or systemic illness as well as hair-specific conditions such as telogen effluvium.
- Scalp biopsy—usually performed only if the physician hair restoration specialist needs information that only a biopsy can provide—such as a condition affecting scalp hair follicles. Biopsy is not necessary for the great majority of patients evaluated for hair loss or hair restoration. Scalp biopsy performed for hair loss or hair restoration has no relationship to biopsies performed to diagnose cancer.
- Hair shaft evaluation—examination of the extracted hair shaft under a microscope can reveal hair shaft abnormalities and infections that may be responsible for hair breakage, shedding or unruliness.
- Hair analysis—a sophisticated laboratory test ordered by the physician hair restoration specialist to provide specific information such as (1) altered hair protein profile due to an inherited abnormality, or (2) drug or heavy metal contamination. Hair shaft analysis has no value for the diagnosis of systemic disease or nutritional status, contrary to claims by non-physician “hair analysis specialists”.

Most persons seeking hair restoration have male or female pattern hair loss—a condition simple to diagnose and readily treatable. Additional diagnostic tests are not usually necessary for these patients.

### Surgical Treatments for Hair Loss

#### *Communication: The Bridge Between You and Your Physician Hair Restoration Specialist*

When you consult a hair restoration specialist, you and the physician share the same objective—to determine if your needs and wishes can be satisfied by a hair restoration surgical procedure or medical treatment. You and your physician have to begin building mutual understanding about:

- Your objective and subjective perceptions of yourself and what you want hair restoration to accomplish;
- The physician’s objective evaluation of what can be accomplished technically and aesthetically; and,
- The cost of recommended treatment options.

The bridge of understanding is built by honest two-way communication:

- You tell the physician why you want hair restoration, and what you want hair restoration to accomplish in improving your appearance. Hair restoration may be only a part of your perceptions regarding self-image. Thinning or lost hair is not an isolated condition; it influences your image of yourself and the image you want

to present to others. Your wishes regarding hair restoration should be discussed in the context of your overall wishes—for example, “to look and feel younger”, “not having a scalp that looks shiny and bare”, “being more comfortable around people”, “to improve self-confidence”. Of particular importance is the area of your scalp where hair loss bothers you the most.

- After the physician hair restoration specialist conducts a medical, physical and scalp examination, options for hair restoration can be discussed, based on diagnosis and assessment of the probable progression of hair loss. In rare cases a patient’s medical history and/or examination indicates that the patient is not a candidate for hair restoration, or that the options for treatment are limited. In the majority of persons the cause of hair loss is male or female pattern androgenetic alopecia (inherited pattern hair loss) that is easily treatable.
- The physician hair restoration specialist will show you collections of illustrative photos or sketches that you and the physician can use to identify the “look” you want to achieve. On the basis of diagnosis and assessment, the physician will describe and recommend the surgical and/or non-surgical treatment most likely to give you that “look”. You should discuss with the physician the relative cost of the recommended treatments in dollar amounts, avoiding imprecise terms like “expensive”, “inexpensive”, “more” and “less”.
- Before agreeing to a treatment plan you should be certain you understand your options, and each treatment’s benefits, risks and cost. You should be comfortable that all of your questions have been addressed.
- After you are comfortable that all of your questions have been addressed, you and the physician hair restoration specialist can agree on a hair restoration treatment plan, including the outcome of treatment that can reasonably be expected. Most hair restoration patients are very satisfied with the outcome of treatment. Mutual understanding between you and the physician hair restoration specialist is one of the most important steps in achieving satisfaction.

### *Hair Transplantation*

Hair transplantation is the most common surgical method of hair restoration. The most common reason for hair restoration is hair loss due to an inherited tendency for androgenetic alopecia (AGA). In men, AGA is better known as male pattern hair loss, in women as female pattern hair loss. While hair transplantation is performed more often in men, it is also a successful method for surgically correcting the diffuse pattern of female pattern hair loss.

Hair transplantation is an operation that takes hair from the back of the head and moves it to areas of hair loss elsewhere on the scalp. The fringe (back and sides) of hair on a balding scalp is known as donor dominant hair. It is hair that will continue to grow throughout life, even in men who have the most extensive form of male pattern hair loss. Donor dominant hair follicles are under a different form of genetic control than follicles on the front and top of the head; they are not subject to inherited effects of “balding genes”.

When donor dominant hair follicles are transplanted to bald areas of the scalp they continue to grow hair. Donor dominance is the scientific basis for the success of hair transplantation.

The area to which donor dominant hair follicles is transplanted is called the recipient area. Candidates for hair transplantation are those individuals with hair loss who have sufficient donor dominant hair from the back and sides of the scalp to transplant to recipient balding areas.

The most common method for harvesting donor dominant hair is to slice it out in strips with a special scalpel-like device. Follicles are separated out from the strip and prepared for transplantation. The transplant grafts are placed into the recipient areas. Depending on how large a recipient area is involved, and on individual patient characteristics, transplantation of the recipient area may be accomplished in one, two, three or more sessions. Multiple sessions are usually spaced several weeks apart.

Among the assessments made by the physician hair restoration specialist are (1) how rapidly, and (2) how much of the patient's remaining hair is likely to be lost. A man with progressive male pattern hair loss may require a number of hair transplantation procedures over a number of years to keep pace with hair loss. In these patients the physician hair restoration specialist wants to be certain that an adequate supply of donor dominant hair will be available for future transplantation. In some cases the progression of hair loss between transplant procedures can be slowed or halted by supplementary medical therapy with an FDA-approved hair restoration drug—topical minoxidil (Rogaine®) or orally administered finasteride (Propecia®).

Hair transplantation surgery techniques have improved enormously over the past decade and are still improving. The first hair transplants were characterized by “plugs” and “corn rows” of transplanted hair. Today, most hair transplantation is done with mini-grafts of fewer than 5 hair follicles, micro-grafts of 2 or 3 hair follicles, and single-hair grafts. Plugs are occasionally used for special purposes in individual patients. Employing newer techniques and newer instruments, the physician hair restoration specialist can create a natural hair appearance that is appropriate to each individual patient.

**Naturalness of appearance is the goal of all hair transplantation today.**

Mini-, micro-, and single-hair grafts provide the “softness” necessary for creating a natural hairline. Graduated placement of single-hair, micro-, or mini-grafts allow creation of a gradually increasing hair density from hairline to mid-scalp. Individual physician hair restoration specialists make their own adaptations of new technology to achieve desirable aesthetic results for individual patients.

Side effects of hair transplantation surgery are usually minor: mild pain and discomfort for a few days postoperatively, swelling over the operated areas, and scab formation. The physician hair restoration specialist provides medical for discomfort control and information about scalp care. The physician also provides information and recommendations for long-term hair and scalp care to maximize the patient's appearance.

### Scalp Reduction

Scalp reduction is simply the surgical removal of bald scalp. The operation is highly effective (1) in carefully selected patients, and (2) when performed by a skilled and experienced physician hair restoration specialist. The good candidate for scalp reduction is a man who has full hair on the back and sides of the head that can be stretched upward to cover the area where bald scalp is surgically removed. A small number of hair transplant grafts may still be needed to cover residual bald areas.

Scalp reduction may, in some patients, be preceded by scalp expansion. A thin plastic envelope is inserted under the scalp and gradually inflated with saline over a period of time. As the envelope inflates the scalp expands in response to the inflation. When the envelope is removed, there is an excess amount of bald scalp available for removal and for “stretching” hair-bearing scalp upward.

Scalp reduction can be associated with postoperative complications of scarring, stretch-back of the bald area, and the creation of an unnatural appearance called a slot deformity.

### Scalp Flaps

Scalp flap surgery entails moving entire segments of hair-bearing scalp into a bald area. The movement is accomplished by surgically creating a “flap” of hair-bearing scalp that can be moved along with its blood supply to a bald area. Scalp flaps are also employed in reconstructive surgery to cover scalp areas with hair loss due to burns or physical injury. The surgeon performing scalp flap surgery should be skilled and experienced in the procedure.

### Eyebrow and Eyelash Restoration

Eyebrows and eyelashes are important components of facial symmetry. They can be lost or lacking for a number of reasons—physical injury, burns, disease, chemotherapy, radiation, scarring caused by long-term plucking, and congenital inability to grow them.

Eyebrows and eyelashes can often be restored by (1) transplantation of hair-bearing skin from another area, or (2) flap surgery to move a flap of hair-bearing skin from the scalp to the eyebrow. Eyebrow and eyelash restoration requires a skilled and experienced surgeon.

### Non-surgical Treatment

Two hair restoration medications have been approved by the U.S. Food and Drug Administration (FDA) after appropriate double-blind, placebo-controlled clinical trials. It is important to note that only two hair restoration medications have won such approval. Many products are advertised and marketed with a claim for hair restoration, but few have ever been subjected to the clinical trials necessary to prove efficacy and safety.

The U.S. FDA-approved hair restoration medications are:

- Minoxidil (Rogaine®)—a topical solution available over-the-counter in 2% and 5% strengths. Minoxidil is effective in some people, moderately effective in

some, and ineffective in others. When effective, minoxidil can retard hair loss and stimulate new hair growth. Its mechanism of action is not well understood. Best results with minoxidil are often achieved by combining the topical solution with hair restoration surgery.

- Finasteride (Propecia®)—an oral medication that treats the root cause of male-pattern hair loss by inhibiting the activity of the hormone responsible for hair loss. Finasteride is available only by prescription. Finasteride is usually not prescribed for women; women who may become pregnant are at risk for a certain type of birth defect in the unborn child. Finasteride works best for early to moderate degrees of hair loss. Men with extensive hair loss are unlikely to have much regrowth. Regrowth associated with finasteride is better over the crown of the scalp than at the frontal receding hairline. When used in conjunction with hair transplantation, finasteride may prevent further hair loss while transplantation fills in areas such as the frontal hairline.

#### *Hair Additions and Replacements*

A small number of people with hair loss are not candidates for surgical or medical hair restoration. For these persons, hair additions and total hair replacement may be considered:

- A person with temporary total hair loss due to radiation or chemotherapy may be a candidate for temporary total hair replacement (a wig).
- A person who is congenitally unable to grow hair may be a candidate for permanent total hair replacement (a wig, or several wigs for different occasions)
- Hair additions may be a temporary measure for the person who wants hair loss corrected but is not yet ready to undergo hair transplantation.
- Hair additions or replacements may be considered by the person who has too little donor dominant hair for use in hair transplantation.

The physician hair restoration specialist can recommend hair additions and replacements for those persons who are not candidates for surgical or medical hair restoration.

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