

The treatment of female pattern hair loss and other applications of surgical hair restoration in women

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In the specialty of surgical hair restoration, men comprise more than 90% of the patients treated; however, in the last few years the number of women undergoing the procedure has increased significantly. The reasons for this growth are many and include the increase in public awareness of the efficacy of hair transplantation from such sources as the media, the Internet, advertising, and word of mouth. More importantly, advances in technique have significantly improved results, increasing the confidence level in women to undergo the procedure and in hair transplant specialists to offer it.

Etiology of hair loss in women

As in men, the overwhelming majority of cases of hair loss in women are genetic in origin. Female pattern androgenic hair loss occurs in approximately 10% of women. The onset can be as early as the late 20s to early 30s, with steady progression most commonly accelerating with menopause. Several classification schemes have been applied to describe the degree of hair loss. The scheme used most often, the Ludwig Classification, describes the most common pattern: diffuse thinning along the top and upper sides and back of the head, often sparing the frontal hairline [1]. Hair loss in women can also follow several other patterns, which have been described in the literature. Diffuse thinning can often be a variant of Ludwig Class 3, but in some cases it displays no

preference for the top of the head, instead involving the entire scalp. Another pattern involves the central aspect of the hairline and extends posteriorly in a triangular shape.

Hair loss in women can be caused by a variety of other causes. While it is beyond the scope of this article to review all of them, several of the most common are discussed. Hormonal alterations or abnormalities such as hypothyroidism, pregnancy, and menopause can be associated with diffuse hair thinning. These causes must be ruled out and treated as indicated. Traction alopecia, which is more common in African American women, occurs because of excessive pulling of hair from hair weaves or hair systems. This is a slow, gradual process that often develops over a period of years. Trichotillomania, an obsessive-compulsive disorder characterized by incessant hair pulling, can result in patches of baldness. More common in women, it usually begins in adolescence and can involve all hair-bearing areas, not just the scalp. When the psychological aspect has been controlled, hair transplantation can restore permanent hair growth. Elevated body temperature, which occurs with a fever, nutritional deficiencies (ie, iron) from unhealthy dieting or other physiological abnormalities, chemotherapy, and infection can cause hair loss, most of which is temporary and reverses itself with resolution of the underlying problem or condition. Alopecia areata, an autoimmune-like disorder, results in patchy areas of hair loss that usually resolve with time.

A variety of pathologies cause scarring alopecias. This group includes lichen planopilaris and discoid lupus [2]. Alopecic scarring and hairline distortion from prior plastic surgery is a common complaint in women presenting for surgical hair restoration. The

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most frequent manifestations are the absence of sideburns from rhytidectomy and visible alopecic scarring along browlift and rhytidectomy incisions [3]. Other hair sequelae that are a result of prior surgery include abnormal hairline elevation from certain browlift approaches and diffuse thinning of the upper temporal region anterior to certain rhytidectomy and browlift incisions [4].

The approach to rhytidectomy that seems to cause the most hair problems is the one that incorporates incisions that extend from the upper aspect of the ear in a superior (rather than horizontal and anterior) direction. While this approach is more effective in treating lateral brow ptosis, it can result in excessive elevation of the sideburns. This approach is also associated with diffuse thinning of the upper temporal region, especially in the area anterior to the incision. This hairline distortion and thinning seems to be caused by vectors of tension in a superior–posterior direction and inadvertent transection of the superficial temporal artery. These sequelae of prior plastic surgery can be treated effectively with hair transplantation [5]. This procedure is capable of restoring hair growth in the areas of thinning and scarring and recreating the normal anatomy of the receded hairline.

Finally, hair transplantation can be used to restore or reinforce hair growth in other parts of the body (please refer to the article entitled “Hair transplantation to the eyebrow, eyelashes, and other parts of the body,” in this issue). The most common of these areas is the eyebrows, where it is somewhat common to see poor density or limited areas of coverage associated with a history of hair plucking or repeated electrolysis in the past. Because the donor area for these transplants is the scalp, the transplanted hairs continue to grow and require once or twice monthly trimming.

Workup and consultation

The first step in the approach to women who have hair loss is to be sensitive to the enormous psychological toll it inflicts. While men who have hair loss can be insecure or sometimes depressed, in women the impact can be devastating. These women have often already received some “advice” from family or hairdressers, some of which might have merit but often is incorrect. The consultation provides the practitioner with the opportunity to listen to and educate the patient and to present a plan of treatment.

Female pattern hair loss is basically a diagnosis of elimination. First, medically known causes of hair

loss need to be considered and evaluated to eliminate any medically treatable problem and to assess the prospective success of hair transplantation. Often, even if a medical condition is diagnosed it might be superimposed upon a case of genetic hair loss.

Workup of the female patient who has hair loss starts with a comprehensive, directed history. Some of the more important events/issues to discern are family history of hair loss, medications, diet, menstrual cycle and pregnancy history, diet, illnesses, stress, and hormonal alterations. It is also important to discern whether the patient has had slow, progressive thinning versus acute shedding (the latter is more typical of telogen effluvium, in which some insulting event typically 3–4 months earlier causes a rapid loss of hair). A review of medications is important because oral contraceptives, the statins for hypercholesterolemia, coumadin, and β blockers can cause hair loss. Physical examination focuses upon scalp and hair abnormalities (including the pattern of hair loss) but also examining other parts of the body for signs of hormonal alterations. A hair pull test assesses not only whether there is breakage of hairs versus hairs pulling out from the follicles but also the degree of acute hair loss.

Workup typically consists of several blood tests including complete blood count, thyroid function tests, ferritin and iron, Venereal Disease Research Laboratory (VDRL), Antinuclear Antibody Test (ANA), Dihydroepiandrosterone (DHEA)-sulfate, and total testosterone levels [6]. Women who have regular menses and no infertility or hirsutism are unlikely to have androgen excess, so testosterone and DHEA levels are not indicated in these patients [7]. A scalp biopsy is often indicated because it can differentiate alopecia areata and telogen effluvium from female pattern androgenic alopecia [8]. A smooth scalp devoid of pores is suggestive of a cicatricial alopecia and is an indication for a scalp biopsy. Assuming that no etiology is detected, the presumptive diagnosis becomes female pattern hair loss. When the diagnostic workup has been completed, treatment options are presented.

Treatment options: nonsurgical

After the diagnostic workup any treatable abnormalities and other potential etiologies need to be addressed. Referral to an endocrinologist for hypothyroidism or other endocrinologic abnormality, or to a hematologist for anemia or low ferritin, is prudent. Patients need to be counseled about proper dieting if a nutritional abnormality is suspected as a contribut-

ing cause. Women who have poststress telogen effluvium (eg, after pregnancy or high fever) should be reassured that return of normal hair growth can be expected within several months after the event.

Cases of traction alopecia must be first managed by complete cessation of application of hair weaves. In addition to hair additions that by their securing to hair causes some alopecia, hair pieces or systems worn for prolonged periods of time, sometimes days or even weeks at a time, seem to further hamper hair growth in general. Women are therefore advised of the vicious cycle that hairpieces incur: the hairpiece exacerbates hair loss while the further hair loss makes the patient more reliant upon the hairpiece. In women who undergo a hair transplant procedure, the wearing of a hair system must be minimized for the first 3 months to not interfere with the regrowth of transplanted hairs.

In nearly all cases of hair loss in women, regardless of the etiology, several treatments or interventions are recommended. If not already used on a regular basis, all women are advised to begin minoxidil 2% (although many women tolerate the stronger 5% concentration, which is approved for use in men), the only medication to have received U.S. Food and Drug Administration (FDA) approval for the treatment of hair loss in women. A topical medication, several drops are applied to areas of thinning twice a day. Six to 12 months are required before significant results can be detected, and once started the medication must be continued to maintain results. Side effects are minimal, most commonly scalp pruritis. Another side effect occasionally seen in women is facial hypertrichosis, which is reversible upon stopping the drug. Minoxidil 5%, designed for men, can be used off label in women with greater efficacy than the 2% formulation [9], but anecdotally it as a greater incidence of facial hair growth as a secondary effect.

Finasteride 1 mg (Propecia) is the other medication with FDA approval for the treatment of hair loss, but only in men. In pregnant women there is a risk of androgenization of the fetus in utero. Furthermore, in postmenopausal women, in whom this risk is not relevant, no benefit has been shown by finasteride in treating hair loss.

While minoxidil is the only FDA-approved medical treatment, a variety of products are promoted for the treatment of hair loss in women as well as men. Some of these are anecdotally effective, whereas others (eg, scalp massages and other stimulatory treatments) offer little, if any, scientific benefit. The author advises patients regarding the therapies available, allowing the patient to make her decision about which, if any, products to use. Shampoos such as the

Nioxin products (which are promoted as enhancing hair growth despite having no scientific evidence in support of this claim) seem to work by volumizing, making the hair appear thicker. Other shampoos, such as Nizoral (McNeil Consumer & Specialty Pharmaceuticals, Fort Washington, Pennsylvania) and Head and Shoulders (Procter & Gamble, Cincinnati, Ohio), used on a once or twice weekly basis, might help slow down hair loss by interfering with the formation of or binding to the hair follicle of dihydrotestosterone, the hormone that (at least in men) is a contributing cause of androgenic hair loss. Certain nutritional supplements might help promote healthy hair growth, including biotin and zinc, and they are available in most commercial vitamins designed for thinning hair.

Treatment option: surgery

Surgical hair restoration remains the only permanent treatment for hair loss in men and women. Note that it is not a cure; it does not stop the process from progressing. Rather, it treats the manifestations, restoring hair growth in areas experiencing thinning or frank hair loss. For more than 50 years, starting with the use of large plug grafts 4 mm in diameter, the concept behind hair transplantation has remained the same—the transferring (or transplanting) of more permanent hairs from the back and side of the head to areas of thinning. The phenomenon of donor dominance assures that, once transplanted, the hairs will retain their ability to continually grow as if they were still in their original location.

Most types of hair loss in women are appropriately treated with hair transplantation. The most important criteria include an adequate donor area, appropriate motivation with reasonable expectations, and the absence of any medical conditions that would put the patient's health or success of the procedure at risk. In addition, with certain etiologies of hair loss such as alopecia areata and some infectious and scarring conditions, it is necessary to ensure that the "process" that caused the hair loss has stabilized, without any evidence of still being "active." With certain etiologies of hair loss such as hypothyroidism, correction of the medically treatable condition is unlikely to result in hair regrowth, only stabilization of the progression of the loss, whereas with other etiologies such as nutritional deficiencies, their correction is likely to result in a return to near-normal hair density. Patients are counseled regarding the almost certain need to perform hair transplant surgery in conditions in which no hair regrowth is expected.

Surgical technique

The biggest challenge in hair transplantation has been the attainment of undetectable results. This has largely been accomplished through the use of smaller and smaller grafts to mimic the way hair grows naturally in the scalp. When looking closely at the scalp and the pattern of hair growth, it becomes readily apparent that hair grows out in little bundles of one to four (most commonly two or three) hairs. These bundles, called follicular units, also contain a tiny muscle, the arrector pili, and a glandular component surrounded by a fine adventitial sheath [10]. For most cases of hair transplantation, natural appearances are achieved through the transplanting of these follicular units, which are best dissected out under the microscope.

There are exceptions to the concept that superior results are only attained through the exclusive transplanting of follicular unit grafts. One group in particular in whom the exception applies is some women who have female pattern hair loss. Transplanting with grafts containing three to as many as five or six hairs, depending upon hair color and other characteristics, balances the goals of maximizing density, minimizing traumatic loss of hair from the procedure and maintaining a natural undetectable appearance. The rationale behind these larger grafts is that for every graft placed an incision needs to be made—an incision that has the potential for causing iatrogenic hair loss because of the proximity to surrounding hairs. If a single graft containing four or five hairs can be placed in an incision that is only minimally larger than that required for a two- or three-hair graft, then the maximum benefit in terms of increasing hair density can be achieved with the minimum risk of surrounding iatrogenic hair loss. To reap the benefits of traditional follicular unit grafts (minimal nonhair-bearing skin, smaller size, and minimal accidental transection of hairs during the dissection process), dissection is still performed under the microscope.

While some follicular units naturally contain three or four hairs, the majority contain two hairs. By combining two follicular units, forming a follicular unit “family,” it is possible to create many grafts containing three to six hairs. These larger grafts are not placed along the hairline (where, similar to in men, one- and two-hair grafts are used) but rather in areas of thinning between already existing hairs.

Not all women are appropriate candidates for transplantation with follicular unit “families.” In particular, women who have high donor density, dark-colored hair, or hair shafts of wide diameter are at risk for developing a “transplanted” appear-

ance if grafts larger than single follicular units are used. Women undergoing transplantation to restore receded hairlines or absent temporal tufts (sideburns) that often are the result of prior rhytidectomy or browlifting are also in this group. Because of the visibility of these areas due to their leading edge position and the lack of existing hairs to blend in with the transplants, it is necessary to use pure follicular unit grafts, with only one- and occasionally two-hair grafts placed along the anterior-most edge. In addition, hair transplantation of the eyebrow is best accomplished with the use of all one- and two-hair grafts; however, these are the minority of cases.

The procedure

Procedures are performed under oral sedation in an operating room using a sterile setup. Patients are typically given 10 mg each of diazepam and zolpidem tartrate (Ambien), which provides a nice combination of relaxation and some degree of amnesia. Marking out of the areas to be transplanted is performed in accordance to what was discussed in the consultation.

During the initial consultation the author always tries to determine the exact areas of hair loss with which the patient is concerned and present a plan to best restore hair into those areas. In general, because the supply of donor hairs is limited and it is expected that the patient will likely desire or require additional procedures in the future, the author's goal is to achieve the appearance of the greatest amount of hair coverage within the patient's anticipated hairstyle. Women who have hair loss are usually quite adept at creative hairstyles that maximize the appearance of hair coverage; adding hairs into the most critical areas can go a long way toward further enhancing this appearance. For example, placing additional hairs along the anterior hairline and part region in a woman in whom the hair is brushed back and away from the part will provide more coverage than if the hairs were instead placed primarily in the middle of the scalp.

When marked out, the patient is brought into the procedure room, where anesthesia is injected into the recipient and donor areas of the scalp. To make this step as pain-free as possible, neck massaging is performed simultaneously with administration of anesthesia by a computerized injection system called The Wand (Milestone Scientific, Livingston, New Jersey). By injecting the anesthesia at a flow rate at or just below the threshold of detection, The Wand eliminates most (if not all) of the discomfort. By injecting along the pathways of the nerves that provide

sensation to the recipient and donor regions, anesthesia can be attained with a small amount of agent—typically no more than 8 to 10 cc—thus reducing the incidence of postprocedure edema. Furthermore, to reduce the traumatic telogen effluvium to which female patients are particularly susceptible, the author avoids the injection of epinephrine into the recipient areas.

When the scalp has been prepped and draped sterile, the donor tissue is excised as a single fusiform-shaped strip using a number 15 scalpel blade. To facilitate the removal of the donor strip and control hemostasis, tumescence with a dilute epinephrine solution is first applied to the donor tissue. The donor region is located along the back and occasionally the sides of the scalp, usually at the level of the top of the ears, where the hair typically has the greatest density and the resultant donor site scar will heal the best. The size of the donor strip depends upon the number of grafts to be transplanted. For example, a procedure of 800 to 900 three- and four-hair grafts would typically require a donor strip of 15 cm² in size, 1 cm in width (a width that results in minimal scar formation) by 15 cm in length. Closure of the donor site is performed with a single row of simple running 3-0 polypropylene (Prolene; Ethicon, Sommerville, New Jersey) sutures.

When harvested, the donor strip is then turned over to the assistants. Under binocular microscopic visualization, the surgeon's assistants dissect from the strip the individual grafts. This is a demanding process, requiring careful dissection to not transect follicles while excising the maximum amount of nonhair-bearing scalp tissue. Because in women the goal is to achieve the maximum increase in density, most of the grafts, with the exception of those that are to be placed along the anterior hairline, contain three to five hairs. Because of their pronounced visibility, only one- and two-hair grafts are typically placed along the hairline.

Simultaneous with graft dissection, the recipient sites are made. This is, the author feels, the single most critical step in the procedure because of the importance that the direction, location, and pattern of graft recipient sites play in determining the final appearance. The author therefore makes all recipient sites, not leaving them to be performed by assistants. For the creation of recipient sites, tiny slits are made using microblades as small as 0.7 mm up to 1.6 mm in size. Typically, grafts of two, three, four, and five hairs fit nicely into recipient sites 0.9, 1.1, 1.3, and 1.4 mm in size, respectively. These recipient sites are carefully made between existing hairs in a direction that is parallel to the surrounding hairs to avoid

accidental transection. The depth of the recipient sites is 2 to 5 mm depending on the length of the follicles.

When performing hair restoration for the treatment of scars, absent sideburns, and other sequelae of plastic surgery, the procedure varies somewhat. For example, when reconstructing the sideburns or the anterior temporal and frontal hairline, special attention must be paid to proper recipient site direction, and the use of the finest one-hair grafts is recommended when cosmetically desirable (Fig. 1). Another case, transplanting into scars, requires a different approach. In these cases, because the goal is to maximize hair growth to provide the most coverage, larger grafts are used. Typically, three to five hair grafts are implanted because it is expected that one quarter to one third of the hairs will not grow in the fibrotic, less vascular scar tissue.

For graft placement, jewelers' forceps, atraumatically grabbing the fat around the base of the hairs, are used. To minimize pit formation, characterized by a small depression of the skin around a contracted group of hairs from a graft, a small cuff of skin from the graft is left sticking above the surface of the surrounding scalp. With the inevitable contracture of the graft that takes place in the healing phase, the surrounding skin will still remain at or just above the surface of the scalp, preventing pitting.

When all grafts have been implanted, the scalp is cleaned and the hair is combed to check for any trapped hairs under the grafts. No bandages are used, and the patient is discharged home. Medications

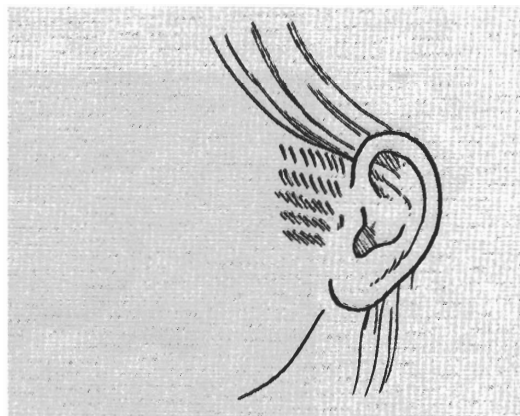


Fig. 1. Technique of sideburn restoration. Note that the direction of the grafts is primarily inferior along the superior region then becomes more horizontal/posterior in the inferior region.

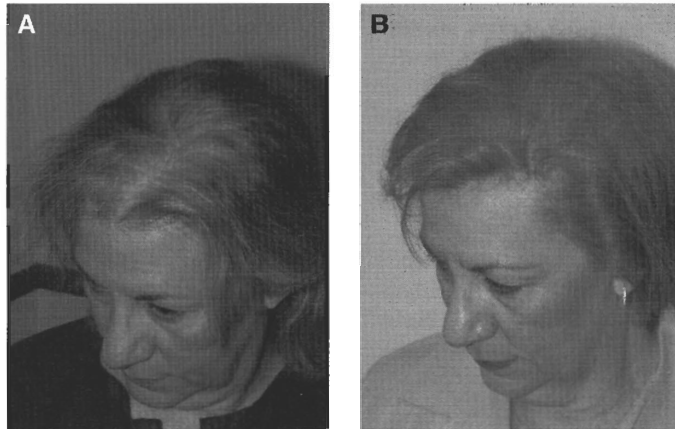


Fig. 2. Patient (A) before and (B) after a single procedure of 660 grafts for the treatment of female pattern hair loss.

include an antibiotic, prednisone to reduce edema, and a mild analgesic. Patients also use a copper-containing saline spray called GraftCyte (Procyte Corp., Redmond, Washington), which seems to accelerate healing. Most patients return to the office the next day for hair washing, after which gentle hair washing can be resumed at home. Sutures are removed on the eighth to tenth day, at which point most of the crusts are gone or should be rubbed off.

Regrowth of transplanted hair is expected at 3 to 4 months. This interval can be shortened by as much as 6 weeks by the regular application of minoxidil to the transplanted scalp starting the tenth day after the procedure. Hair tinting or coloring can be resumed 3 weeks postprocedure. Patients are advised that it

can take as long as 12 months before the final results are apparent. Many female patients undergo a second procedure, sometimes as soon as 6 months later, to achieve more density, or especially after several years to replace original hairs that have fallen out because of the progression of female pattern hair loss.

Case examples

Fig. 2 shows a 55-year-old woman before and 7 months after a single procedure of 660 grafts for the treatment of female pattern hair loss.

Fig. 3 shows a 58-year-old woman who desired repair of scarring and hairline distortion secondary to

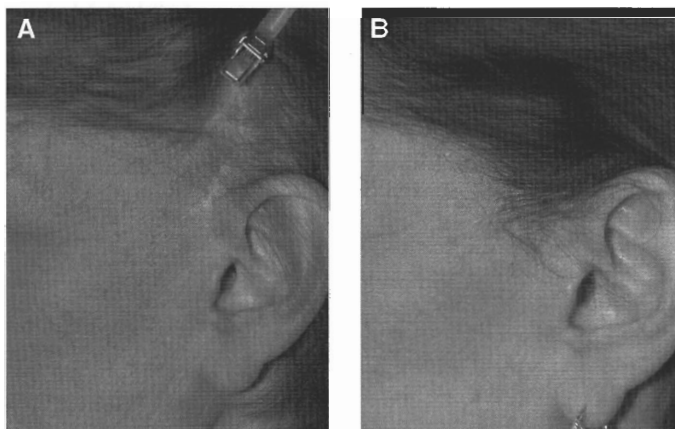


Fig. 3. Patient (A) before and (B) after a single procedure of 750 grafts to restore the normal hair pattern after rhytidectomy.

prior rhytidectomy with browlift and to restore density to thinning areas along the sides of the scalp. She is shown before and 8 months after a single procedure of 750 grafts, of which 375 were used to restore the sideburns.

Final thoughts

Hair transplantation is a viable option for women who have hair loss and hair distortion from many different etiologies. Microscopic dissection, which provides smaller grafts, has led to improved results in these patients. An empathetic approach coupled with conservative use of the usually limited supply of hair can result in satisfied patients.

Patient selection, especially when attempting to treat female pattern androgenic hair loss, is critical. At least a minimal donor site density is necessary to achieve acceptable results. In many of these patients a second procedure to achieve more density is performed, typically 12 or more months later.

In addition to careful patient selection, several additional steps are critical for assuring more successful outcomes. Special precautions such as avoiding the use of epinephrine in the anesthetic solution and performing a relatively limited number of grafts that are each implanted into carefully created recipient sites are helpful in achieving success.

Finally, the role of the medical workup and, if indicated and accepted, the importance of medical adjunctive therapy cannot be understated. Hopefully,

over the next several years new medications will help supplement the results achieved surgically.

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