Elliptical Donor Stereoscopically Assisted Micrografting as an Approach to Further Refinement in Hair Transplantation

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BACKGROUND. *Multiple surgical methods are currently used for hair transplantation. Each method has a specific technique, morbidity, and relatively predictable cosmetic result.*
OBJECTIVE. *To describe a methodology that combines elliptical excision of donor tissue and dissection under stereoscopic magnification into small grafts to obtain an improved final cosmetic result. For the purposes of this paper, any graft small enough to be easily inserted into a 16-, 18-, or 20-gauge needle tunnel will be referred to as a micrograft.*
METHOD. *Three hundred thirty patients underwent transplantation by this method over a 6-year period. All patients were photographed before, during, and upon completion to monitor results.*
RESULTS. *Cosmetic results as documented by examination and photography represent a further refinement due to the large number and small size of grafts placed.*
CONCLUSION. *The author considers the method described as a viable alternative technique in hair transplantation for both limited and extensive androgenetic alopecia.* J Dermatol Surg Oncol 1994;20:789–793.

A technique utilizing elliptically excised donor tissue for obtaining micrografts for hair transplantation is described. Micrografts are obtained from the elliptically excised donor tissue by dissection beneath a stereoscope (dissecting microscope). No tissue is removed from the recipient bed, thereby preserving existent hair in the recipient site and minimizing vascular insult. The clumping or stalking effect associated with traditional round plug grafting is eliminated and a more natural distribution of recipient site hair is achieved.

Since punch grafting as an approach to hair transplantation was first described by Okuda[1] and Orentreich[2] numerous techniques to refine the final cosmetic result have been described. The use of progressively smaller grafts such as those described by Tamura,[3] Fujita,[4] Pouteaux,[5] Nordstrom,[6] Marritt,[7] Shiell and Norwood,[8] Bradshaw,[9] Brandy,[10] and Lucas[11] have all contributed to progressive cosmetic improvements particularly in the frontal hairline. The incisional slit grafting technique described by Stough et al,[12] methods combining both micrografts and minigrafts such as described by Uebel[13] and Rassman and Pomerantz,[14] and procedures utilizing micrografts only as described by Inaba et al[15] and Stough[16] expand the use of smaller grafts to refine the cosmetic result over the entire grafted area. Many of these techniques utilize punch excision of donor tissue and reduction of such grafts to smaller grafts. Cohen[17] and Swinehart and Griffin[18] have described harvesting of the tissue remaining between punch graft removal sites and utilizing that residual tissue to create micrografts for the frontal hairline. Utilization of such methods have profoundly enhanced the procedure of hair transplantation by creating aesthetically more natural results.

During the last 6 years, we have utilized a modification of the previously described procedures for grafting the entire area of androgenetic pattern loss in some 330 patients involving some 566 settings. We believe this procedure offers a further step in refinement of final results. We have termed this procedure "elliptical donor, stereoscopically assisted micrografting."

As in micrografting and incisional slit grafting procedures previously described by other authors, no recipient site tissue is removed. Because grafts are placed in needle-created recipient tunnels, attention need only be directed toward maximizing density. The problem of tufting is eliminated by the small size of the grafts. The compromise of the vascular bed is minimal compared with punch and incisional techniques. The preservation of existing hair in cases of early androgenetic alopecia disguises very effectively the ongoing procedure. The ability to continue normal shampooing and grooming, the minimal crusting that occurs, and the rapidity of healing allow most patients to continue uninterrupted their normal schedule of activities from the first postoperative day. The uniform dispersal of small grafts gives the patient the advantages of choosing the number and timing of future procedures and does not commit him to a preset requisite number of settings. Additional settings may be

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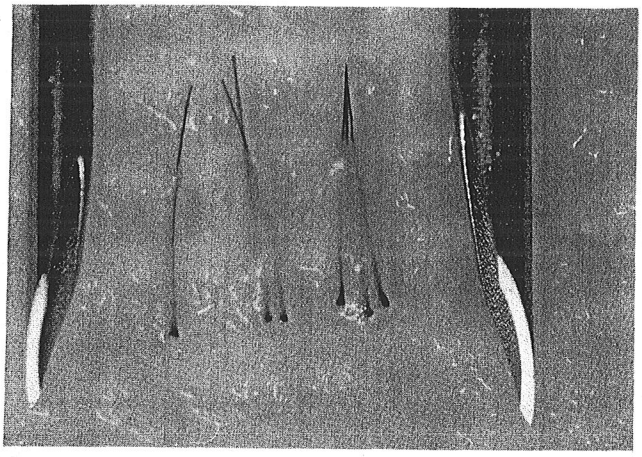


Figure 1. Examples of one-, two-, and three-hair micrografts with 16- and 18-gauge needle tips (original magnification, ×10).

Table 1. Advantages of Elliptical Donor Stereoscopically Assisted Micrografting

1. Prevents tufting or "corn row" appearance of grafted area.
2. Creates the most "natural" hairline possible.
3. Significantly reduces donor and recipient site healing time.
4. Allows for patient to return to full work and recreational schedule in 24 hours.
5. Minimizes recipient site visibility during healing phases.
6. Minimizes donor and recipient site scarring.
7. Maximizes donor site usage.
8. Preserves preexistent recipient area hair.
9. Increases the number of surviving hairs per graft.
10. Increases number of candidates for both early and advanced alopecia correction.
11. Allows for choice of sparse to dense coverage.
12. Procedure can be used to camouflage standard punch grafting.
13. Does not commit patient to continue procedure (may quit anytime and still have acceptable cosmetic results).

elected to increase density and to expand into areas not previously covered.

Materials and Methods

The terminology of grafts differing from standard round punch grafts has evolved to include half grafts, quarter grafts, strip grafts, slit grafts, minigrafts, and micrografts. The technique described in this presentation utilizes only micrografts containing from one to four hairs, small enough to allow for implantation into tunnels created by 16-, 18-, or 20-gauge needle puncture of the skin (Figure 1). These grafts are created by sharp dissection of an elliptical donor that measures approximately 1.5 cm in width and 10 cm in length. Depending upon density of the individual follicular groupings within the donor area, such an ellipse will bear approximately 1200–2400 hairs. The micrografts are obtained by first blocking very carefully the donor ellipse (Figure 2) as one would slice a loaf of bread. All such dissection is carried out beneath a stereoscope (dissecting microscope) at a magnification power of ×5–10. Such microscopic assistance prevents the inadvertent loss of follicles during the dissection process. We have found double-edged razor blades upon whose sharpness we can constantly rely to be of great assistance. Gradle scissors are occasionally used in creating a micrograft. Recipient site tunnels for placement of micrografts are created utilizing 16–20-gauge needles depending upon the graft size.

The donor area is trimmed and anesthetized in the standard fashion using lidocaine with epinephrine. Great care must be taken in the excision of the ellipse to incise parallel to the hair shafts to minimize marginal loss of follicles. The excision is carried to the deep subcutaneous tissue to avoid loss of any hair bulbs. Hemostasis is accomplished and a standard double layer suture closure is performed. Sutures are removed at 7–14 days. The elliptical donor tissue is immediately placed in chilled saline upon removal and prior to closure of the donor site.

The frontal hairline is premarked with careful attention to maintain a natural frontotemporal recessional pattern for creation of a normal adult male hairline. Since placement with this procedure requires additional time (ordinarily 3–4 hours), attempts are made to advance the anesthesia approximately 30 minutes in advance of the current working area in order to gain the maximal vasoconstrictive effect of the epinephrine.

No tissue is removed from the recipient bed, and care is taken to place the micrografts between existent hair in order to maxi-

Figure 2. Donor ellipse.

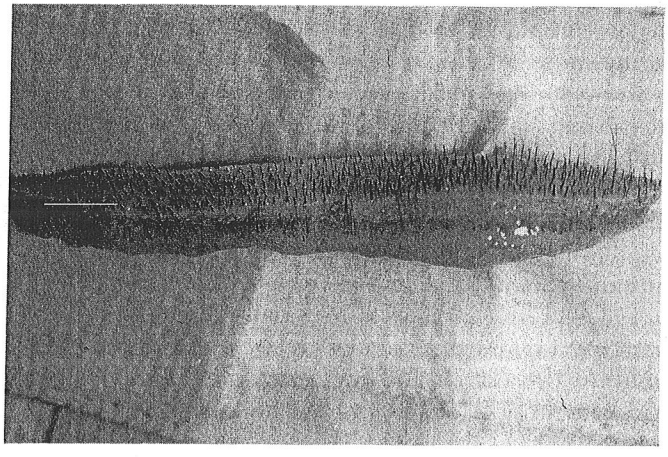
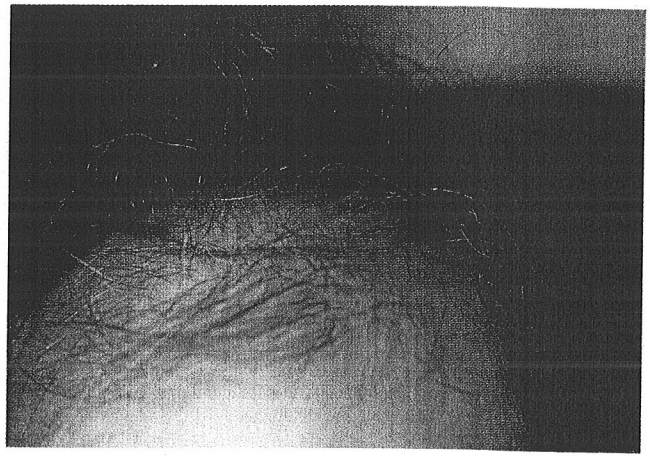


Figure 3. Patient 1. Before restoration of frontal hairline. Dye marks anticipated frontal hairline.



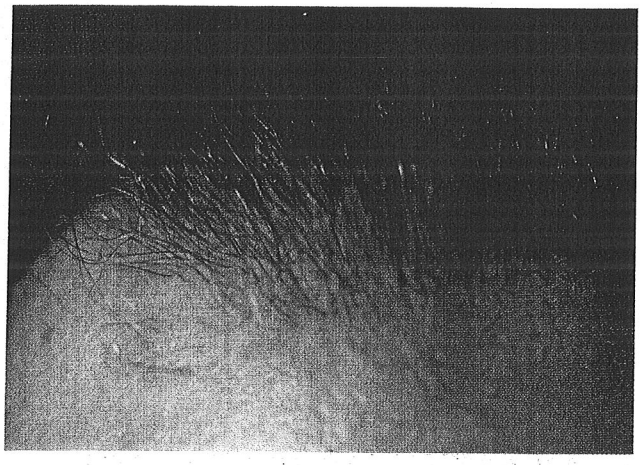


Figure 4. Patient 1. Frontal hairline after one setting.

mize the benefit of such placement. Care is taken in the frontal hairline to angle the tunnel in an anterior direction to gain the additive effect of forward thrusting of the hair shaft as it grows. Fine tipped jewelers forceps are utilized for the careful handling and placement of grafts into the recipient tunnels. As the working area is moved, the index finger of the technician is placed over the most closely adjacent preceding grafts in order to keep them from extruding as the next recipient tunnel is created. We have found dilators of no major advantage since the needle tunnels created are perfectly adequate to accept grafts that contain one to four hairs with ease. Every attempt is made to place the maximal density of micrografts as the procedure is advanced. With progressive experience, technicians become very adept at placement of grafts as close as 1–3 mm apart. Depending upon density of donor hair, total numbers of dissectable grafts available from the donor tissue, size of donor ellipse, experience and adeptness of dissecting and placement technicians, and total time devoted to the procedure, 400–700 grafts can easily be placed in a 5-hour procedure session. We have noted over 6 years of experience that progressively larger numbers of grafts have been able to be moved in the same period of time and progressively greater density of placement has been achievable totally based on the experience of the technicians. We ordinarily work with a team of one to two dissecting specialists creating micrografts using stereoscopes and one technician placing these grafts into the recipient sites.

Discussion

Many advantages are inherent in the use of micrograft techniques (Table 1). The most obvious of these is the elimination of tufting or corn stalk appearance of the individual grafts (Figures 3–10). Other advantages include preservation of preexistent hair in the recipient sites allowing the patient to continue normal grooming activities. The technique does not commit the patient to a set number of procedures but allows him to elect future procedures based totally upon the distribution and density of coverage desired. Procedures may be spaced according to the patient's wishes and financial abilities—there is no necessity to require timing of procedures to be spaced at specific intervals due to the cosmetic appearance of the

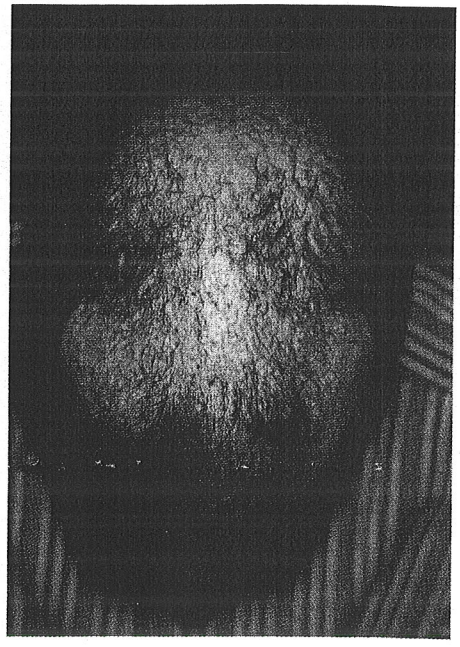
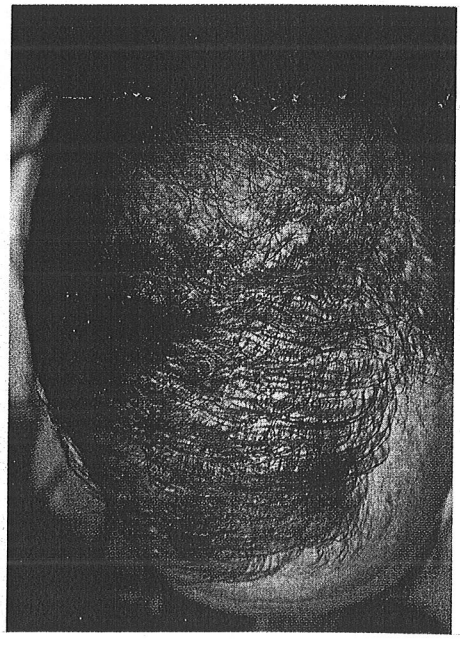


Figure 5. Patient 2. Before restoration by micrograft hair transplantation method.

previous settings. Additionally, the procedure can be used as an adjunct to improving the cosmetic quality of those who have had previous punch graft sessions.

We feel that because of the naturally elegant appearance of micrografts, the procedure increases the number of those who are candidates, even expanding the procedure to pattern VI and pattern VII types of loss. It also allows those candidates having significant density of hair

Figure 6. Patient 2. After two settings of micrografts.



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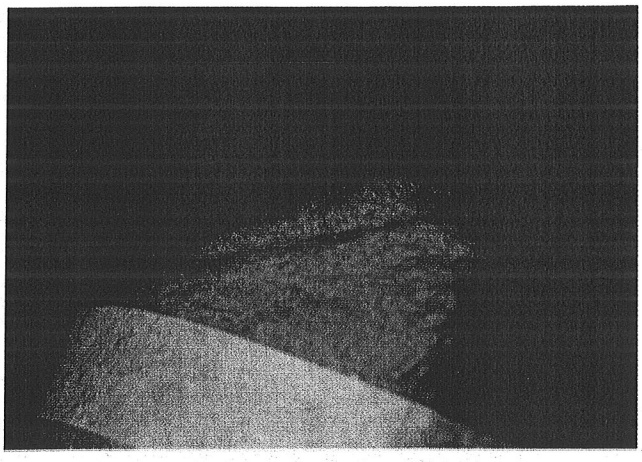


Figure 7. Patient 3. Left frontal scalp before micrografts. Dye marks anticipated frontal hairline.

remaining in the androgenetic pattern area to consider transplantation without the usual temporary thinning experienced with punch grafting. Those candidates with multiple residual hair do not have to sacrifice those hairs to the standard punch grafting technique but can have the density increased by insertion of grafts between preexistent hairs.

The use of the elliptically excised donor likewise contributes certain advantages to this procedure. The first and most obvious is rapid healing of the donor site. Sutures can generally be removed at 7 days. Since no islands of hair-bearing skin are left behind as occurs with punch grafts, the elliptical donor technique allows for maximal utilization of the donor site. There is obviously minimal donor site visibility during the healing phase since the donor site represents a sutured line. The same donor site scar may be utilized repetitively for future donors allowing for one incision line. We have found the ability to expand the donor site into the lateral occipital zones and even into the temporal regions to be feasible because

Figure 8. Patient 3. Left frontal scalp after two sets of micrografts.

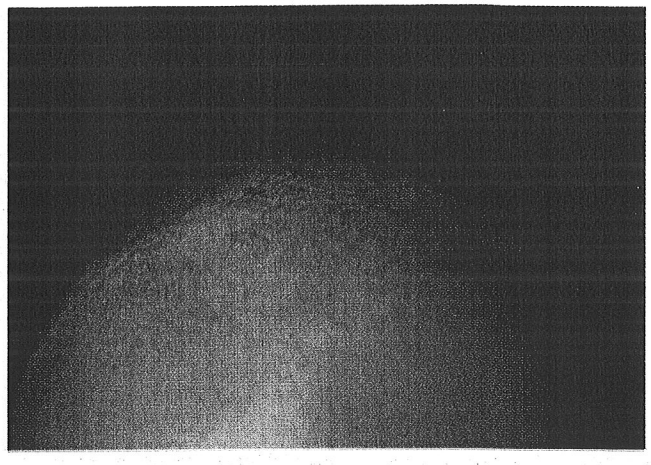


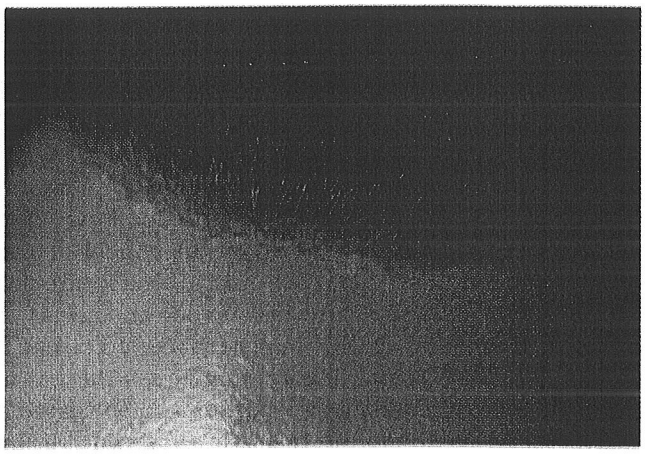
Figure 9. Patient 4. Frontal scalp before micrografts.

suturing makes the donor site so inconspicuous. Expansion of the donor site, particularly into the lateral scalp with standard punch graft techniques, is often slightly visible in our experience. Therefore, we feel that the elliptical donor technique allows for maximal utilization of donor site hair without creating a visibility of scarring as occasionally occurs with punch grafting. We have abandoned the use of multibladed knives in taking donor tissue and prefer the single-bladed knife method.

We have found the use of the dissecting microscope or stereoscope (Figure 11) to be of great assistance to us. Magnification allows for extremely precise cutting of micrografts thus avoiding loss of hair follicles. The stereoscope provides a stable stage on which to work under magnification. This autoclavable cutting surface is large enough to access the entire donor tissue until it can be blocked into smaller, more workable units. The stereoscope's adjustable magnification provides a very clear visual field to the technician, assisting thereby in the development of maximal precise speed of dissection.

The procedure is not without its disadvantages. It is

Figure 10. Patient 4. Frontal scalp after four sets of micrografts.



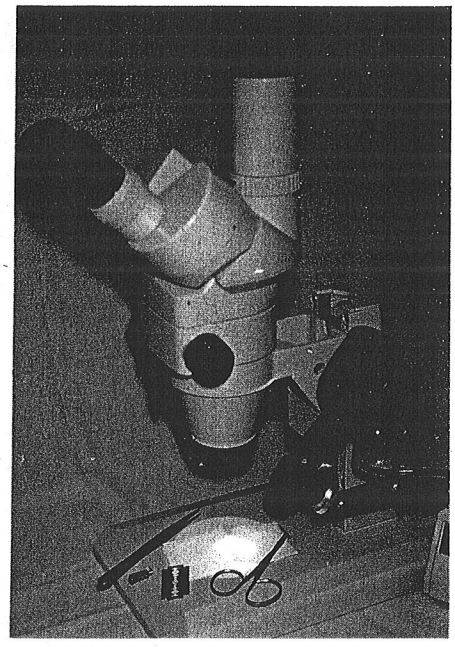


Figure 11. Stereoscope, illuminator, and dissection instruments.

very labor intensive and painstakingly exact. Great care must be taken by the dissecting technicians working beneath the stereoscope to preserve all hair follicles throughout their full length. After sizeable experience operators become capable of consistently generating in the range of 100–300 grafts per hour. Additional equipment and well-trained personnel are obviously required to transfer adequate numbers of grafts in a reasonable procedure time. If large numbers of grafts are to be placed, additional operating technicians must be trained and given adequate time to gain experience. Utilizing an experienced team of technicians, we have been able to consistently move 700 micrografts during each 5-hour session. The development of trained and experienced technicians and the acquisition of specialized equipment (stereoscopes) may increase cost.

Disadvantages common to all transplant procedure include discomfort at the donor and recipient sites. The discomfort experienced by the patient at donor and recipient sites is similar to that experienced with standard punch grafting. Analgesics may be required for the first postoperative day but many of our patients have elected to utilize none. Forehead and periocular edema is similar to that experienced with punch grafting in the frontal zone. We have found that preoperative dosing of 40 mg of prednisone at the beginning of the procedure and daily prednisone dosage of 60 mg for the first 3 postoperative days greatly reduces the forehead and periocular edema. It has been argued that micrografting procedures do not generate the density of standard plug procedures. The author contends that any appearance of lesser density is more than compensated for by the natural cosmetic elegance of small grafts.

The overall advantages of this procedure parallel those previously described with incisional slit grafting and micrografting by other authors. We readily admit that initial procedures with this technique may be met with a certain degree of frustration by even experienced operators in the field of hair transplantation since this is a very labor intensive and painstakingly precise procedure. However, we feel that those who are willing to pay the price in terms of patience and persistence will find the cosmetic results of a highly inconspicuous and natural appearing recipient area justify the efforts.

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