Hair Transplant Forum International

INTERNATIONAL SOCIETY OF HAIR RESTORATION SURGERY

forum

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Ischemia-Reperfusion Injury and Graft Storage Solutions

Jerry E. Cooley, MD *Charlotte, North Carolina*

Introduction

In the course of follicular unit transplantation, thousands of hair follicles are removed from one place and transplanted to another. We are all aware of the issue of growth and how important it is in achieving density and patient satisfaction. Most of us accept that the most important factor in obtaining optimal growth is avoiding physical trauma by transplanting physically intact hair follicles that have not been transected, dehydrated, or crushed. After this, we realize how important vascular perfusion in the recipient bed is to the survival of our grafts. Primary factors in reducing vascular perfusion are scarring from prior surgery and overzealous operative injury to the recipient bed with incisions that are too big or too dense. Beyond this, we recognize infection, idiopathic factors ("X factor"), and, perhaps, "something the patient did" in affecting the growth of our grafts.

However, another key consideration is what I call biochemical factors, something to which we as hair transplant surgeons have paid little attention. When surgeons transplant whole organs (e.g., livers and kidneys), they consider these factors as important as immunologic rejection in determining the viability of the transplant. Of course, careful immunologic matching and immunosuppressive medications help avoid rejection. A tremendous amount of research has been done to identify and overcome biochemical injury to transplanted tissue and organs, research that has direct implications for hair transplantation. These biochemical factors can be divided into ischemia-reperfusion injury (IRI) and storage injury.

IRI has been a research interest of mine for the past couple of years. Put simply, IRI is the biochemical injury to the transplants that occurs after they have undergone a period of low oxygen (ischemia) and then implanted in the recipient sites where they are exposed to oxygen (reperfusion). It's an automatic reaction that is only partially understood. What is known is that IRI results from the formation of "free radicals," sometimes called reactive oxygen species (ROS). This occurs in both the transplanted cells as well as the neutrophils present in the recipient tissue. These free radicals can be thought of as "molecular terrorists" that bounce around, injuring the inside and outside of the cell. Damaged cells within the hair follicle may result in suboptimal growth.

Does IRI injury occur in transplanted hair follicles? To answer this, I used a standard method of checking for free

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Regular Features

Feature Articles

The BIG One, Down Under

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The ISHRS Golden Follicle Award sculpture, as seen on the cover of this issue, was designed by Francisco Abril, MD. Dr. Abril offers for sale, copies of a small bronze hair follicle sculpture (10" high). For more information, please contact: Clinica Dr. Francisco Abril, PO dela Habana, 137, 28036 Madrid, Spain. Phone: 34-1-359-1961; Fax: 34-1-359-4731.

President's Message

Mario Marzola, MBBS
Adelaide, Australia

Farewell dear colleagues. This is my last message to the readers of the *Hair Transplant Forum International* as President of the ISHRS. It has been the finest honour of my professional career to serve this Society that we call our own. It is the pursuit of honest scientific knowledge in a sharing, friendly, and inclusive environment that makes the ISHRS so special. This is the heritage that Drs. Dowling Stough and O'Tar Norwood left us when they started it all twelve years ago.

The Society has taken a collective breath this year, taken another look at all its functions, its Code of Ethics, its Bylaws, its meetings and workshops. We are a more mature Society now so our processes and mechanisms need to reflect that maturity and the world in which we operate today. It reminds me of the airline pilot checking everything, testing everything before letting loose with the jet engines and taking off. There is so much talent coming through the ranks of the ISHRS wanting to serve and help our Society that it will literally take off like a jet plane in the next few years. So many more people will then benefit from sharing our knowledge.

I wish to thank all our committees, in particular the chairpersons whose work often goes unnoticed. Please continue to contribute to our great Society. The Annual Scientific Meeting Committee of Drs. Ed Epstein, Sharon Keene, Paco Jimenez-Acosta, Bernie Nusbaum, Jim Harris, and Jerry Cooley and Betsy Shea deserve special mention. It looks like they have put together another outstanding learning experience for Vancouver in August. I look forward to seeing you all there, learning a lot, and kicking up our heels!

The ISHRS is in good shape. Our guidance from head office is sensational. Victoria Ceh and her helpers look after us like we were a member of their own family. I leave you comfortably in the hands of my good friend Dr. Tony Mangubat and wish him all the pleasures I have had during my term as President.✧

Cheers,
Mario Marzola, MBBS

To Submit an Article or Letter to the *Forum* Editors

Please send submissions via a 3½" disk or e-mail, Remember to include all photos and figures referred to in your article as separate attachments (JPEG, Tiff, or Bitmap). For e-mail submissions, be sure to ATTACH your file(s)—*DO NOT* embed it in the e-mail itself. We prefer e-mail submissions with the appropriate attachments. Any person submitting content to be published in the *Forum* agrees to the following: 1. The materials, including photographs, used in this submission do not identify, by name or otherwise, suggest the identity of, or present a recognizable likeness of any patient or others; or, if they do, I have obtained all necessary consents from patients and others for the further use, distribution, and publication of such materials. 2. The author indemnifies and holds harmless the ISHRS from any breach of the above. *Send to:*

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Submission deadlines: September/October, August 10 • November/December, October 10

Co-Editors' Messages

William M. Parsley, MD
Louisville, Kentucky

The 12th Annual Meeting of the ISHRS is just about here and it is looking like another great meeting. I had a chance to talk to Dr. Ed Epstein, the Program Chair for this year's meeting. Except for a little last minute shuffling that will inevitably occur, this year's lineup is set and he is quite pleased. Dr. Jim Harris is the Workshop Chair and the workshops look like they might be the best we have ever had, with a smorgasbord of topics dealing with subjects ranging from basic science to techniques, disease recognition and treatment, instruments, practice building, Board preparation, and much more. I looked them over and feel some disappointment that they couldn't be spread so I could attend all of them. Remember, attendance is limited so look over the list and contact the ISHRS immediately to get into a workshop of interest to you.

Dr. Beehner's assistant, Betsy Shea, LPN, is the Surgical Assistant Program Chair. I know that Betsy will do a great job. Our assistants are vital to us and their continuing education and enthusiasm are most important to our practices. One of my personal favorite programs to attend annually is the Beginner's Program. (Hint: It's not just for beginners.) Once each year Jack Nicklaus would come back to Columbus, Ohio, to visit his golf teacher, Jack Grout. He would say, "Jack, I am a beginner and I want to start with the basics and go over my swing." If the best golfer the world has ever known can do it, we can too, and we will be the better for it. Drs. Sharon Keene and Francisco Jimenez-Acosta are running the Beginner's Program this year and have a terrific lineup of speakers. At the same time, Dr. Bernie Nusbaum will chair an Advanced Review Course, supposedly for those at a slightly higher level. Both are great reviews for doctors at all levels. How frustrating for people such as myself who would like to attend both! Each year I probably take more notes in these sessions than in the rest of the meeting combined. While these sessions cater to less experienced or beginner doctors, there's nothing "beginner" about the speakers. They are a lineup of some of the best our field has to offer. Some of the "basics" and "fundamentals" in our field are somewhat subjective and it is always interesting to hear the opinions of these doctors.

I guess for me and for many of my colleagues, a highlight of this year's meeting will be the exposure to CAG (lateral) grafting. Vancouver is the home of Drs. Jerry Wong and Victor Hasson. They use a technique of making small densely-packed incisions oriented 90° to the intended hair direction of the graft (which is usually the same direction of the existing hair and at the same angle).

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Michael L. Beehner, MD
Saratoga Springs, New York

Assorted musings while sitting on my front porch:

On "all-FU" vs combination grafting debates: I find myself more and more reluctant to get into passionate debates with "all-FU'ers" regarding the merits of including minigrafts (which are actually microscopically-cut DFUs and TFUs in our practice) in selected patients anymore. In fighting these battles, I feel a little bit like a Jehovah Witness trying to convert a Methodist. It's not worth the aggravation, doesn't accomplish anything, and both parties are probably better off continuing to use the method they have been using for years to get good results in their own hands. Aggressive marketing by some in our profession, along with the FU biases of most of the Internet hair sites, work against easily "selling" this approach to some patients, but I feel confident that in years to come, after more research and experience have gone by the dam, that the multi-FU graft will rightfully reclaim a respected position in the overall scheme of transplanting. Whoops, there I go getting myself all worked up and aggravated again! Gotta move on to something else….

Recent New York Times *article on hair transplantation:* The *Times* ran a very nice two-page article on advances in hair transplantation on Tuesday, June 15, 2004, in the "Science Times" section of the paper, along with excellent photos and diagrams to help explain the procedure. It is the kind of exposure that hopefully will go a long ways toward helping to erase in the public's mind the old image of detectable plugs on a bald scalp. It can also be viewed on the Internet at the following address (you're going to need your pen for this one!): http://www.nytimes.com/2004/06/15/health/15hair.html?page wanted=1.

On "securing the home base": Most of us who practice hair transplantation full-time have the burden of somehow making ourselves known to enough people out there to ensure a steady stream of patients that keeps us busy and our staff steadily working without layoffs. As I consider this topic, a number of thoughts come to mind that I think are worth sharing: I feel strongly that the most important marketing task for every hair surgeon is to nurture his or her home base. That is, if any person within your surrounding catchment area thinks about having a hair transplant, your practice should be visible enough (and hopefully have a good enough reputation) that he or she at the very least comes to you for a consultation

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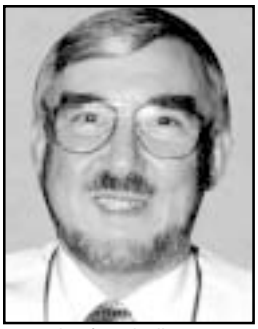
Notes from the Editor Emeritus



Richard C. Shiell, MBBS
Melbourne, Australia

Annual ISHRS Meeting

The year 2004 has passed with more than usual rapidity and now we are at Annual Meeting time again, albeit a couple of months earlier than usual. (I understand that this is to get in some Canadian sightseeing before everything ices up for the winter.) There is much happening in our field and, as I did not attend any other meetings during the year, I am greatly looking forward to the Vancouver ISHRS Annual Meeting in mid-August.

New Textbook

After 4 years of waiting the Unger/Shapiro textbook has arrived from the publisher, and I am sure that no one who has had the good fortune to see it will be disappointed. It is a wonderful achievement and a worthy successor to Dr. Unger's preceding three editions. I fully intend to review it when time permits but for the time being I urge you all to lodge an order and add it to your shelf of "must have" books. To the experienced hair surgeon or tyro, it will be as important as your dictionary or your Encyclopedia of general knowledge. Do not expect to read it in one sitting, however, as it has nearly 1,000 pages packed with the most carefully selected and edited information. There are some 30 contributors but no rubbish is allowed here, with every contributed line carefully vetted by Drs. Unger and Shapiro, with Editor's Notes attached where they wish to clarify or disagree with a point.

Dr. Ron Shapiro

It was a delight to see Ron given the honor of a *Pioneer* biography in the May/June 2004 *Forum* (Vol. 14, No. 3, p. 89). While not one of the "grey beards" of our profession, he has a most interesting medical background and he has filled these past 14 years with more creative activity than many can achieve in twice that time. Still young, and with his great energy and integrity, he is a man to watch in our Society over the years ahead.

Orlando Meeting

This continues to be a highlight of the HT year thanks to the encouragement of MHR President, Dr. Matt Leavitt, and the enormous energy of Dr. David Perez-Meza. They are ably assisted by a bevy of experts who turn up year after year to run the Scientific Sessions, Workshops, and Live Surgery. This year the meeting was followed by the ABHRS examinations at which 11 candidates presented and 14 dedicated diplomates from former years were on hand to administer the Examination. I urge all serious practitioners of hair transplantation to attend the ABHRS and ISHRS Advanced Course in Vancouver and to consider taking this exam in 2005 or at some time in the future.

Aegean Cruise

If you want a meeting with a difference, I draw your attention to the Annual DHI meeting that will be held at the Athens Clinic on October 3 and later during a 4 day Aegean cruise on board the ship *Olympic Countess*. The cruise will have stopovers in Mykonos, Kusadasi, Patmos, Crete, and Santorini. This year the main focus scientifically will be on FUE but the Greeks know how to enjoy life and once lectures end the fun begins. I have attended this meeting twice and would go every year if time permitted.

Follicular Unit Extraction

After early derision by many doctors, this technique continues to attract attention as its place in the armory of HT procedures is assessed. A small number of practitioners practice follicular extraction exclusively, but an increasing number are using it for small area transplants and scar repair. The outstanding article, "FUE Megasessions—Evolution of a Technique," by Drs. Bernstein, Rassman, and Anderson in the May/June 2004 *Forum* (Vol. 14, No. 3, p. 97) provides an excellent summary of how to perform FUE surgery and its possible role in hair restoration surgery.

While there are a small number of individuals who are obsessed with the possibility of bad donor scarring, this is in fact a fairly uncommon occurrence in the hands of experienced surgeons. FUE requires even greater surgical expertise so it is unlikely that the patient will be able to get a cheap FUE "fix" from his or her corner surgeon. The past and present members of NHI Group are to be congratulated for their ethical and unselfish sharing of their accumulated FUE knowledge with ISHRS members over the past 4–5 years.

The Donor Site

Despite all the money and time being poured into cloning research and the development of better tissue preservatives, simple surgical matters, such as the management of the donor site, continue to be largely ignored. The matter is frequently debated in private on the Internet and in bars and corridors at meetings (often with more heat than light) but remarkably little scientific research has gone into methods of producing the optimum suture line.

Those of us who have been suturing the donor site for over 20 years all agree with certain facts, however:

1. Most donor sites heal with 1–2mm or less, whatever technique is used, even in the presence of moderate tension.
2. Women and older patients seem to get better scars.
3. The lower regions on the parietal and occipital site are more likely to produce wider scars.
4. A small subset of patients gets unsightly scars of 3mm or more, whatever technique is used, even

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Case Report: Arteriovenous Fistula

Nicolas A. Lusicic, MD; Alejandra Susacasa, MD; Sebastián Abalo Araujo, MD *Buenos Aires Argentina*

Introduction

The appearance of arteriovenous fistulae after hair restoration surgery is extremely infrequent, occurring in 1 case out of every 5,000 procedures, according to the bibliography consulted.

In our experience, it has occurred in 1 case out of every 7,000 procedures perfomed.

This complication used to be more frequent with old techniques like punch and skin flaps.

From a pathophysiologic standpoint, it is important to note the following:

1. If the arteriole's blood flow is low, it tends to heal spontaneously.
2. If the blood flow is high, the risk of vein arterialization increases.

Objective

The objective of this work is to present the case of a patient with an arteriovenous fistula.

Case Report

The case is of a 44-year-old patient with Norwood 4 alopecia (Figures 1 and 2). A frontal procedure was performed with 1,050 grafts in 2001.

On the 15th post-operative day, the patient reported throbbing in the region of the right frontal vein. On physical exam, we can see a dilation of the frontal branch of the superficial temporal vein that matches with the arterial pulse (Figure 3).

Figure 1. Pre-op

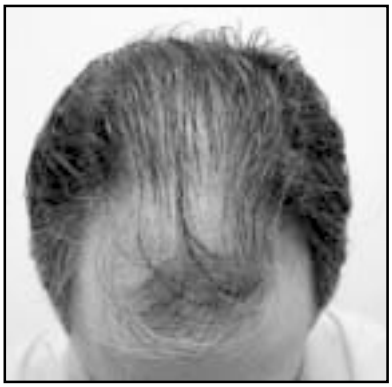

Figure 2. Pre-op

Figure 3. Dilated vein from AV fistula

With the diagnosis of an arteriovenous fistula, we scheduled the surgery. It is important to identify the exact place where the pulse appears. When that point is compressed, the vein should collapse. We proceeded to make the distal and proximal ligation of the fistula, and then closed the wound. We can see the immediate collapse of the superior part of the frontal branch of the superficial vein (Figure 4) and can appreciate how the inferior section was evident previous to the hair microtransplant (Figure 5). The patient responded satisfactorily and has been discharged.

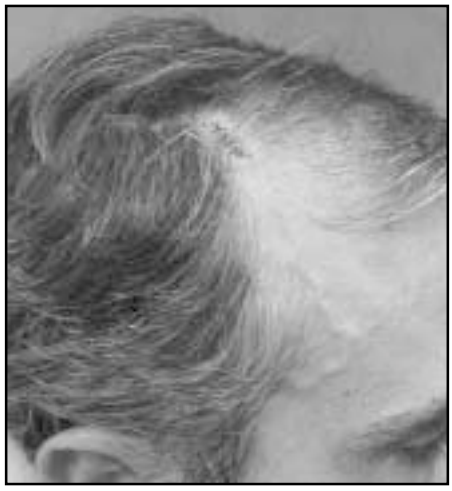

Figure 4. Collapse of vein post-op

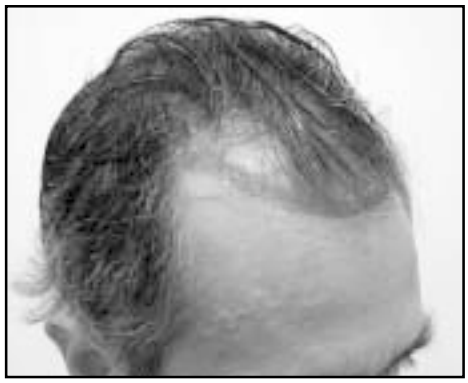

Figure 5. Some dilation of vein evident pre-HT

Conclusion

This case was presented to point out that, although arteriovenous fistulae is an exceptional complication, it has to be taken into account because it doesn't always resolve spontaneously, as described in literature, and its surgical repair requires the application of vascular and aesthetic criteria.✧

"Failures are divided into two classes: those who thought and never did, and those who did and never thought."

—John Charles Salak

Jung Chul Kim, MD: Improving Survival of Follicular Unit Grafts

James L. Breeling (Summarized from "The Cutting Edge" Session, 11th Annual Scientific Meeting, New York, NY, October 2003)

James L. Breeling, a professional medical writer and editor, is an independent consultant to the ISHRS and assisted the Forum *in covering several keynote talks at the ISHRS Annual Meeting in New York.*

Although the follicular unit (FU) graft marks another important step in the creation of natural-appearing transplanted hair, the technique's long operating time and use of more delicate grafts introduce a number of factors that can affect graft survival and potentially manifest as poor growth. In a presentation titled "Factors Affecting Graft Survival," Jung Chul Kim, MD, told colleagues at the ISHRS 11th Annual Meeting in New York how some of these factors can be addressed. Dr. Kim is in the Department of Dermatology, Kyungpook National University, Daegu, South Korea.

Using techniques he described in his presentation, Dr. Kim reported that he achieves a graft survival rate of 92% and observes no difference in survival rate of one-follicle and two-follicle FUs. No significant difference is observed in hair diameter of donor hairs and regrown hairs in the recipient area.

Dr. Kim described steps taken to improve graft survival during 1) donor harvesting, 2) graft dissection, 3) graft storage, and 4) graft implantation.

Graft Harvesting

Simple elliptical harvesting using a No. 20 blade is preferred to multiblade techniques in the Asian patients treated by Dr. Kim. Because scalp hair follicles of East Asians are longer than those of Caucasians, multiblade techniques increase the risk for follicle transaction during harvesting.

Graft Dissection

A sliding technique using a No. 20 blade is used for graft dissection into one-hair and two-hair FUs. Graft dissection is made more difficult by blood staining of adipose tissue. Transection of FUs can sometimes not be avoided, but the transected grafts are preserved and later are implanted. Upper follicle implants can regenerate thin hairs and lower follicle implants can reconstitute a complete hair follicle.

Graft Storage

Dissected FUs are placed in normal saline chilled to 4°C; preservation at 4°C is superior to preservation at room temperature. Prepared grafts are stored on gauze or Telfa pads in an air-fluid interface rather than in a floating environment. Immersed grafts have been found to absorb excess fluid, causing greater difficulty in placing them into smaller recipient sites.

Graft Implantation

FU grafts were implanted 2.5 hours after donor harvesting in the cases reported here. Time from donor harvesting to implantation should not exceed 6.0 hours. Grafts to be implanted should not be held on the gloved finger of the physician or assistant for longer than 10 minutes in order to avoid drying from exposure to room air and operating room lights.

Use of the KNU implanter has been found to decrease graft handling and eliminate crushing, bending, and squeezing of grafts. Depth and angle of graft insertion are critical to graft survival. Insertion at correct depth decreases risk for folliculitis and epidermal cyst formation. Acute angle of insertion can reduce risk for bleeding and popping.

Grafts are implanted from left to right and from back to front to reduce risk for popping. Implanting from left to right has been found to reduce compression forces on the previously implanted left graft.

The average density of FU implantation is 18 FU/cm^2 for both one-hair and two-hair follicle grafts. Dense packing of >40 FU/cm^2 has been found to result in poorer growth. Placement of 30 to 30 FU/cm^2 with a 19-gauge needle has been found to be safe.

Normal saline or 1.5% hydrogen peroxide is used for scalp cleansing and removal of blood during and after surgery. The standard 3% solution of hydrogen peroxide has been found to adversely affect hair growth.

Survival rate of grafts after FU transplantation is evaluated using a tattoo in both temporal recession areas.✧

IRI Graft Storage Solutions

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radicals (the "MDA" assay) and tested follicular units that had been placed back in the scalp (ischemia + reperfusion) versus grafts that had been soaking in saline (ischemia only). In 7 patients, testing 150 hair follicles, I found that the follicles that had been planted showed a consistent elevation in free radicals, averaging a 200% increase, with some up to a 600% increase over controls. I believe that this study showed that ischemia-reperfusion injury does occur in transplanted hair follicles.

We can imagine that when our grafts are planted, an immediate burst of free radical activity occurs that can potentially damage our grafts and affect their growth. It's reasonable to hypothesize that one- and two-hair grafts, especially if dissected down to the bone, would be more susceptible to IRI than grafts that have more dermal tissue around them. IRI *might* be one explanation for decreased growth, delayed growth, and changes in hair shaft diameter following transplantation.

A tremendous amount of research has been done in the field of organ transplantation that shows that IRI can be lessened to improve graft function. Ways of doing this have included giving the patient antioxidants (e.g., vitamin E, melatonin) or corticosteroids, but the main way has been in using additives to the graft holding solutions. These additives have included allopurinol and glutathione, which are present in "University of Wisconsin" solution, which is considered the gold standard as a holding solution. Other additives that have been studied include vitamins E and C, selenium, glutamate, iron chelators, and a long list of other antioxidants and compounds.

Can IRI be lessened in transplanted hair follicles? To answer this, I repeated my previous experiments, this time comparing saline (control) soaked grafts to those placed in a commercially available graft holding solution (HypoThermosol, BioLife Solutions, Inc., Binghamton, NY). HypoThermosol contains two potent antioxidants, glutathione and a synthetic analog of vitamin E. In 6 patients, testing 72 hair follicles, there was a 47% lower MDA reading in the HypoThermosol group, indicating less free radical injury.

The approach in our clinic to lessen IRI is to soak our grafts in a holding solution containing antioxidants (e.g., HypoThermosol). In addition, we put 0.75mg/cc of triamcinolone acetonide in the tumescent solution injected in the recipient area (average dose injected is about 30mg). Corticosteroids, although not a universally accepted additive to graft holding solutions, have been shown to reduce IRI and improve skin flap viability when administered systemically. By using the triamcinolone in our tumescent solution, we have also seen less post-operative edema and redness.

Storage Injury

IRI occurs after the grafts are planted but storage injury refers to the host of pathophysiologic changes that occur to tissue while it is outside the body. It can be depressing to learn about all of the negative things that happen to tissue outside the body until we remember how well our grafts generally do using standard techniques. By learning what organ transplant surgeons have learned about storage injury, hopefully we can make simple changes to our routine that will further improve our outcomes.

To understand storage injury, we need to review what happens to tissue removed from the body. Once we remove our donor strip, the cells are immediately cut off from their supply of oxygen, glucose, and other necessary ingredients that make life possible. Of course, oxygen is a necessary ingredient for aerobic metabolism, in which ATP is generated to provide fuel for all the cell's energy requirements. When tissue is removed and cut off from its blood supply, it switches from aerobic to anaerobic metabolism, which does not produce enough ATP to meet the cell's energy requirements. Lack of energy supplies and absence of other necessary ingredients lead to apoptosis, or programmed cell death. If enough cells within the follicle die, we would expect that the follicle, even though physically intact, may not survive to produce hair.

One approach to this problem is to use media specifically designed to culture cells outside the body. I experimented for many years with a media called M199, which had been used in culturing dermal papilla cells, and reported my results at the 2001 Orlando Live Surgery Workshop. I had a subjective sense that regrowth occurred earlier, as evidenced by much greater frequency of Pohl-Pinkus hairs. Likewise, Walter Krugluger of the Moser Clinic has found that tissue culture media with apoptosis preventing additives results in more cases of immediate hair growth (*Forum*, Vol. 13, No. 3, May/June 2003).

Another approach to preventing apoptosis is to lower the metabolic demands of the cells by lowering the temperature of the storage solution. Cooling has been used for millennia by man to preserve food, and seems like a logical technique to preserve tissue outside the body. And, in general, this is the case. We can picture the donated kidney being packed in ice and placed in a cooler as it is rushed to a distant city for transplantation. Common sense tells us that cooling is an excellent way to preserve hair follicles before they're placed into recipient sites.

However, cooling tissue causes a whole set of its own problems and produces what researchers call "cooling injury." For example, at lower temperatures, membrane pumps do not function properly, resulting in intracellular edema, a lower pH, and an elevated intracellular calcium concentration, all of which are damaging to the cell. It should be mentioned here that *tissue storage solutions*, such as University of Wisconsin Solution and HypoThermosol, have been specifically designed to support and protect tissue that is being kept at low temperatures. These solutions prevent the pathophysiologic changes that occur with cooling while *tissue culture media*, such as that used by Krugluger, was designed for use at physiologic body temperatures and therefore should not be chilled when used as a graft holding

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Book Review

Review of ***Hair Transplantation, 4th Edition, Revised & Expanded.***
Unger, W.P. and R. Shapiro (Eds.) , Marcel Dekker, Inc., March 2004

John D.N. Gillespie, MD, ABHRS *Calgary, Alberta, Canada*

Dr. James Arnold in his foreword to the book "Hair Transplantation" stated that it is a remarkable book. I want to say at the outset that I agree wholeheartedly.

In this fourth edition, edited by Drs. Walter Unger and Ron Shapiro, there is a wealth of information about all aspects of hair loss and replacement. This is a book of close to 1,000 pages filled with text, photos, illustrations, and diagrams. The layout is well organized and includes chapters on the history of hair transplantation; the embryology, anatomy, and physiology of the hair follicle; the anatomy of the scalp; and all aspects of the medical and surgical treatments of hair loss. There are sections on instrumentation, office setup and design, marketing, emergencies, and complications. There is a chapter on personal techniques that allows many authors to describe, "How I do it." The editors enlisted the help of scores of experts in the field to write on various aspects of hair restoration. It is a literal "Who's Who" of hair transplant legends.

We are privileged to have Dr. Norman Orentriech write about the beginning of hair transplants and his early experiments.

Drs. Bobby Limmer, David Seager, William Rassman, and Robert Bernstein write on follicular unit transplantation.

Drs. Mario Marzola, Gerard Seery, Martin Unger, José Juri, and Patrick Frechet write excellent articles on flaps, extensions, and reductions.

There is a chapter by Dr. Eric Eisenberg on hair loss unrelated to androgenetic alopecia. For those of us who are not dermatologists, it is especially valuable.

The editors did not just edit, however. Drs. Unger and Shapiro both contributed extensively to the text. Dr. Unger personally contributed to almost every chapter.

The long chapter on "Basic Principles and Organization," written primarily by Dr. Unger and Dr. Michael Beehner, is, in my opinion, the key chapter in the textbook. It is an excellent overview of graft types, transplant planning, and hairline design. If the less experienced surgeon doing hair transplants would read and follow just this chapter, the need for corrective surgery would be reduced dramatically. Drs. Unger and Beehner write clearly on what they have been presenting at the ISHRS meetings for many years. Dr. Unger's wealth of experience as a surgeon and author are well demonstrated. Dr. Beehner has added an especially thoughtful and important addition to this chapter. His nomenclature system for the zones and landmarks of the balding scalp and his forelock concepts are critical for the optimal transplant. Dr. William Parsley has a section in this chapter on hair transplant goals based on natural hair patterns. It also is a thoughtful addition. I have appreciated Drs. Unger, Beehner, and Parsley's concepts presented at meetings in the past. To see them written down, to read at my leisure, has increased my appreciation for them, and elevated their significance.

The section on follicular unit transplantation is excellent. Dr. Limmer gives a historical review of how follicular unit transplantation started in his practice, and how it evolved in the late 1980s and early 1990s. He did experiments and hair counts to provide proof of successful growth. Without his persistence and excellence, the technique would not have gained such wide acceptance. Drs. Rassman and Bernstein write on the rationale for follicular units, and Dr. Seager on the pitfalls. This section is essential reading to anyone doing hair transplantation.

The chapters on flaps, scalp reduction, and scalp extension are interesting from a historic and academic point of view but will not be of practical assistance for most readers. I do feel, however, that even those who have never done a scalp reduction (and probably never will) should be aware of the benefits of them, particularly in repair situations.

Most of us are aware of the wonderful results achieved by Dr. Frechet with scalp extension. He writes a well-illustrated précis on the technique. However, I was somewhat concerned about one heading in the chapter: "Tips for the Novice in Scalp Extension."

There is an extensive section on the pre-operative phase of hair transplant surgery, including such simple considerations as hair styling and clothing as well as more important concerns such as OSHA rules and laboratory screening. Lists of medications and supplements that can potentially increase bleeding are included. A good discussion on the use of antibiotics in hair transplant surgery is given. They reach the proper conclusion that, if they are to be used at all, it should be in the pre- and peri-operative periods only.

The section on anesthesia describes the method of action of local anesthetics, as well as opiates and benzodiazepines. The techniques of both local and field blocks are also described.

The book has sections on some of the newest techniques in hair transplantation, including an excellent discussion with photographs by Dr. Victor Hasson on coronal (lateral) slits.

Follicular unit extraction was not discussed in this text. History will tell if this is a significant omission. I suggest it is not.

Hair Transplantation is an excellent reference for both the experienced hair transplant surgeon and the novice. It will become the standard for academic organizations such as the ABHRS and other cosmetic boards. The editors and contributing authors are to be congratulated. Truly remarkable!✧

Bobby L. Limmer, MD
Pioneer of the Month

Michael L. Beehner, MD *Saratoga Springs, New York*

The transformation of our specialty from the "large-graft era" to the present one, in which undetectable replacement of hair is the expected norm due to the incorporation of follicular unit grafts, owes a debt of gratitude to many—notably Dr. Carlos Uebel, the Moser Clinic, and Drs. David Seager, Robert Bernstein, and Bill Rassman—but probably none more than Dr. Bobby Limmer. Dr. Walter Unger has stated in print that Bobby Limmer is the "true father of follicular unit transplantation." So how did it all begin for him?

During his dermatology residency at Brooke Army Medical Center in San Antonio from 1969–1972, Dr. Limmer performed multiple cases of hair transplantation, including a 6-year-old burn victim. He visited Dr. Norman Orentreich's office in New York in 1971. He included standard plugs and mini-graft cases in his practice from 1974–1988, but by the late 1970s and early 1980s, he had become exceedingly selective concerning which patients he would transplant, choosing to do so on only 10% of those that presented because, in his opinion, donor depletion occurred too often before the recipient area could be satisfactorily filled in using the existing methodologies. His background in both dermatology and dermatopathology, plus reading Headington's article in 1984, convinced him that the follicular unit micrograft could be used not only to produce a more natural result, but also to greatly expand the recipient/donor ratio; this was owing to the fact that this ratio was less than 1 to 1 with plug methodology, but with follicular unit methods was more in the range of 2–4 to 1. Around that time, about a dozen of Dr. Limmer's patients agreed to go forward with clinical trials trying this methodology. These began on October 21, 1988, and by 1991, all aspects of magnification, donor harvesting, slivering, graft cutting under stereoscopic microscopes, stick-and-place implantation, and graft survival data were in place. Dr. Limmer published a brief article in the *Forum* (March/April 1991) detailing his methods and reasons for making the change in approach. His landmark article on follicular unit grafting was published in *J Dermatol Surg Oncol* (1994; 20:789–93). By the time this article was published, he was producing graft densities greater than 40 FU/cm^2 and had done megasessions of 2,500 grafts. The rest is history. When asked about the overall experience of these years, Dr. Limmer says the highest reward has been the visits of so many of his colleagues to his office and the friendships that were formed. Dr. Marcelo Pitchon of Brazil was the first to visit him and adopt FU transplanting in his own office back home. He was quickly followed in the mid-1990s by Drs. Agha of Egypt, Tom Rosanelli, Edmund Griffin, David Seager, Bill Parsley, O'Tar Norwood, Mario Marzola, and at least 80 others around the globe in the years since.

Bobby L. Limmer, MD, and wife Carole on mission trip in Mexico

Early years. Bobby was born on December 9, 1941, in Taylor, Texas, the first of 4 children (2 younger brothers and 1 sister). His father was a sharecrop farmer. Work in the cotton and corn fields took up much of Bobby's free daylight hours through high school, where he still managed to letter in football and track. He spent his pre-med years at Texas A & M University (double degrees in English and biology) and finished med school at the University of Texas Medical Branch, graduating with highest honors from both schools.

Clinical career. After his dermatology residency at Brooke Army Center, Dr. Limmer spent 2 years as Assistant Chief of the dermatology training program there. In 1973 he achieved board certification in the specialty of dermatology and followed this up by attaining his boards in dermatopathology in 1974.

Before concentrating mostly on hair transplantation, Dr. Limmer had a distinguished history in the specialty of dermatology. The long list of society and association offices he has held, the professional organizations to which he belongs, and the many presentations he has given—both in dermatology and in hair-related subjects—would fill many pages. He has published over 66 scientific papers or chapters and is a Clinical Professor in the division of dermatology at the University of Texas Health Center at San Antonio.

For all of us that have known him all these years, we would all agree that his professional integrity and his sense of courtesy and respect for his fellow physicians are of the highest order. When I was just starting out in hair transplantation and started to write articles on some of my ideas, several times I received a hand-written note from Bobby saying he enjoyed reading the article and urging me to keep up the good work. His smile and good cheer are always a welcome sight at meetings. And yet he enjoys the tussle of a good professional debate as much

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Pioneer of the Month

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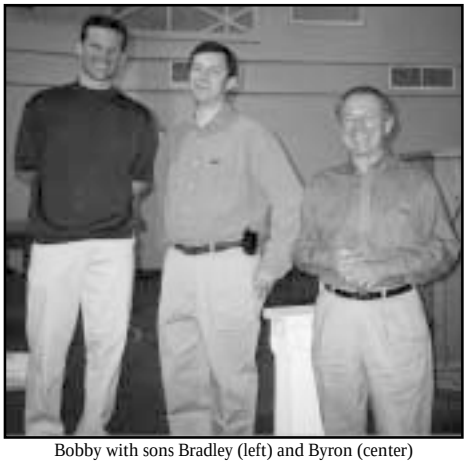
as anyone and is forceful and persuasive in expounding his views.

Family and personal life. In being interviewed for this article, Bobby told me that family and outside-the-office interests play a very central role in his activities today. He related: "A divorce sadly ended a marriage of over 30 years, but a remarriage to Carole has blessed and enriched my life. My two sons, Byron and Bradley, as well as Byron's wife, Rachel, are all board-certified dermatologists and in practice with me. This has given Carole and me great freedom to enjoy the autumn and winter of our lives. We live in a beautiful setting on the Llano River 110 miles from the office, commute and practice 2 days each week, and ranch 1,300 acres, on which we are sole labor providers for our cattle and wildlife management programs. We are active in church and try to do a yearly mission trip of usually 2 weeks to serve the Creator and the needs of others. Our life is full and we are richly blessed."

Well said. And we also are all richly blessed to have Bobby among us as a colleague and for the generosity of spirit he has shown to all of us over the years, in sharing his knowledge and skills. He is truly a hair transplant "pioneer" and will certainly always be looked upon as one of the giants in the history of our specialty.✧



Bobby with sons Bradley (left) and Byron (center)

IRI Graft Storage Solutions

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solution. The bottom line is that if cell or tissue culture media is used, it should be kept at room temperature, not chilled.

Another way to prevent storage injury is to supply oxygen to the cells in an attempt to preserve aerobic metabolism and normal ATP production. Some have tried to keep hair follicles in storage solutions containing perfluorocarbons, which can mimic physiologic oxygen concentrations and far exceed ambient oxygen concentration. The benefits of this, however, were not conclusive. This is clearly an area for more research.

Conclusion

Using microscopically dissected follicular units stored in chilled saline generally results in good growth. One reason that growth may appear to be suboptimal in some cases may be because chilled saline is not the best storage solution and cannot prevent the biochemical injury inherent in the transplant process. As discussed above, it does not contain the nutrients, buffers, or antioxidants to prevent IRI and storage injury. Chilled tissue storage solutions used in organ transplantation or tissue culture media used at room temperature provide numerous theoretical advantages. Hopefully, ongoing research will prove this benefit and further optimize the results of follicular unit transplantation.

The author has no financial interest in the products mentioned.✧

Two New Instruments for Automation

William R. Rassman, MD *Los Angeles, California*

I have been asked to comment about a set of instruments I showed in video format to a limited number of individuals at the 2003 ISHRS Annual Meeting in New York (in the automation workshop and in a series of private viewings). These are general comments about the instruments. I expect to write a paper that will define these instruments and their uses more clearly. As many of you who know me, you have seen my relentless struggle to develop instruments that would solve the problems we confront for training our staff in cutting and placing follicular unit grafts.

The Problem

The process continues to be an intensive *people dependent process* and therefore the results of the surgical hair transplant procedure reflect the quality of our staff on the day they did the work. Many doctors are lucky to have one "superstar" on staff whose skills meet the needs of the surgeon's hair transplant business. Most doctors live in fear of that "superstar" falling prey to sickness or pregnancy, or just losing that person to another competitor who gets into a bidding war for their unique and valuable services. Our hair transplant quality reflects not only the skills of our staff, which often take years to develop, but the daily variability of our staff based upon mood, health on that day, fatigue as the day progresses, the politics of the office, and the many variables associated with any tedious labor-intensive process like today's follicular unit transplant (FUT). I see an aversion to doing FUTs based upon the difficulty of cutting and placing a large number of grafts in any single procedure and, in New York, comments against the FUT procedure seemed to reflect the difficulty of the entire process from organization through training. There have been no negative comments with regard to the quality of the end result for FUTs once an adequate number of grafts have been transplanted in close proximity to each other.

I have always believed that building the infrastructure to perform large scale FUTs was not easy. For many doctors FUTs are impractical because the skills did not build to a satisfactory level based upon a limited number of procedures performed each week. Small FUT grafts are subject to the "evils" of drying and trauma far more than larger grafts, so it is no wonder that larger grafts are the choice for many doctors performing hair transplants. I have been sympathetic with those who have tried and either failed to build that infrastructure or decided against offering FUTs because of the internal costs (money, training, recruitment, stress on the doctor and staff, etc.).

Goal

My efforts have been to equalize the surgical team so that those individuals who do not perform the procedure every day will be able to perform the same quality of transplants as those of us who do several procedures each day. My hope has always been to make a hair transplant procedure just like any other surgical procedure, one that depends upon the quality of the surgeon and his or her assistant without the large team we are so dependent upon today.

Solution

I can now state without hesitation that I have solved the graft placing problem with two unique instruments that I may demonstrate at the 2004 ISHRS Annual Meeting in Vancouver. These two instruments have a short training time and I have been able to teach their use in a matter of minutes, even to those individuals with no prior hair transplant experience. I have called these two instruments: 1) The Percutaneous Implanter Pen™ [PIP] and 2) Hair Implanter Pen™ [HIP]—a totally new design from the older commercial device designed by Pascal Boudjema. As implied in the name, the PIP ("percutaneous") allows the surgeon to place grafts directly into the intact skin in a single step. It functions similar to the "Carousel," which many of you have had the opportunity to see and use at a previous ISHRS meeting (in Washington, D.C.) but it is easier to load, sucking in the grafts prior to placing them, one at a time. The HIP, on the other hand, was designed to place the grafts into pre-made sites and it also loads quickly, sucking grafts into the unit efficiently and quickly. There is an entire science in these two instruments, both with respect to their unique design as well as in their use. I cannot go into the science in this brief commentary.

The legal implications for technician use of the PIP are tied to the laws of the State where you practice. In California the medical assistants use (for "incisions" into an intact skin) is restricted to only venopuncture for properly trained phlebotomists. The State of California notified me in late March that it has refused to review the restriction on the medical assistants despite an extensive submission by me asking for a re-examination. Although these two instruments solve the placement problem, which I believe is the most difficult part of the FUT process, there are cultural and habitual issues where skilled teams may not be willing to accept these instruments. I have seen such resistance, even from my own staff, because the mastery of the forceps has become a "badge of honor" that has been earned by all of those on my staff who have been with me for years. When comparing HIP placement with forceps placement in a skilled technician's hands, speed and delicacy in handling are comparable (as was the case for Dr. Boudjema's HIP). The acceptance of these instruments therefore may not be an easy process. Clearly there is no financial incentive for commercial exploitation of the new HIP.

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Two New Instruments

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Conclusion

Automation solutions are within our grasp, but isolated solutions that are not packaged to solving all of the "people" problems, I believe, cannot take root in today's climate. Solving the "total" hair transplant automation problem could expand the provider pool and open the market for new doctors entering the business. More providers will expand the market. Providers who enter the business today are significantly handicapped because they cannot provide FUTs that are competitive with the finest work being done today. For automation to succeed, it will have to be packaged with a harvesting instrument. Hair transplants will become more prevalent when the *surgeon and an assistant* can supply the service like any other cosmetic surgical procedure.✧

Scalp Pathology for the Hair Transplant Surgeon: Hair Loss Diagnosis

Bernard P. Nusbaum, MD *Miami, Florida*

If one performs enough hair transplant consultations, patients with alopecias of different etiologies will be encountered. The primary requirement in that first visit is to make a correct diagnosis. This is accomplished by taking a directed history, performing a scalp examination using specific clinical assessments, and, in selected cases, performing microscopic analysis of hair and/or scalp biopsy. A complete description of the different alopecias is beyond the scope of this article. A logical approach to narrowing a differential diagnosis and a description of some of the clinical diagnostic tools employed in this process will be presented.

History

In obtaining a history, effort should be made to differentiate between: 1) hair loss vs hair breakage, and 2) thinning vs shedding.

Hair breakage would be typical of chemical damage, trichotillomania, hair shaft anomalies (which are rare), or anagen effluvium (secondary to chemotherapy or toxin exposure).

Hair loss, if diffuse, should direct the history toward differentiating *thinning vs. shedding.* Thinning would be typical of androgenetic alopecia (AGA) or female pattern hair loss (FPHL), whereas shedding would be a characteristic of telogen effluvium. In the setting of diffuse hair loss one should inquire about possible precipitating factors, such as chronic illness, hormonal change, and recent surgery or medications, among other factors (Tables 1 and 2). Also, the time frame from the precipitating factor to the onset of hair loss is important. Telogen effluvium typically occurs approximately 3 months from the time of the precipitating event, whereas anagen effluvium results in hair breakage beginning 2–6 weeks after exposure to the toxin. The work-up of women with diffuse alopecia of undetermined origin should include blood work consisting of CBC, thyroid profile, iron, ferritin, and ANA. If symptoms or signs of androgen excess are present, testosterone, DHEAS, and prolactin levels should be ordered.

Scalp Examination

The scalp examination begins by looking for a recognizable pattern. Interestingly, this approach was utilized in what is, to the author's knowledge, the first reference to hair loss diagnosis (Figure 1). The Old Testament, in Leviticus, Chapter 13, refers to recognition of leprosy for the purpose of quarantine. Even in those ancient times, pattern baldness was recognized by its typical frontal and crown alopecia. Generally recognizable patterns are seen in male or female pattern alopecia, traction alopecia, triangular alopecia, post-face-lift alopecia, etc. If these patterns are *not* recognized, a more thorough history and physical examination need to be performed. It should be noted that alopecias can mimic each other; examples are diffuse alopecia areata and fibrosing alopecia in a pattern distribution, both of which initially suggest a diagnosis of AGA/FPHL.

Continuing with the physical examination, essential determinations are whether the hair loss is diffuse or focal; scarring or non-scarring. The typical clinical appearance of scarring alopecia consists of areas a few millimeters in diameter that can coalesce to form larger patches in which hair loss occurs. In areas of active disease (which typically are at the periphery of the alopecic areas) there is evidence of inflammation with perifollicular erythema and scaling. The inflammatory process results in permanent destruction of the hair follicle with obliteration of the upper follicular duct so that the affected scalp appears smooth, shiny, and devoid of pores (Figures 2–4). Scarring alopecias are listed in Table 3. Each has distinctive clinical, histopathologic, and inmunohistologic features and, generally, biopsy is required for diagnostic confirmation and determination of disease activity.

Figure 1.

"If the hair of a man's head falls out, he is bald at the back of his head, he is pure. And if his hair falls out toward the front of his head, he is frontally bald, he is pure. And if in the baldness there shall be a white affliction streaked with red…, he is contaminated."

—Old Testament; Leviticus, Chapter 13

Figure 2. Typical appearance of Lichen Planopilaris

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Scalp Pathology

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Figure 3. Pseudopelade. This entity may represent the end-stage of other primary scarring alopecias.

Figure 4. Extensive scarring alopecia

Table 1.

Common Drugs That Can Cause Telogen Effluvium

- Oral Contraceptives
- Androgens
- Cimetidine
- Beta Blockers
- Coumadin, Heparin
- Anticholesterol Agents
- Vitamin A
- ACE inhibitors
- Lithium

Table 2.

Telogen Effluvium–Precipitating Events

- Childbirth
- High fever
- Starting or stopping OCAs
- General anesthesia
- Sudden weight loss
- Protein deficient diet
- Hormonal changes
- Drug-induced
- Systemic disease

Table 3.

Scarring Alopecia Entities

- Lichen planopilaris
- Fibrosing alopecia in a pattern distribution
- Pseudopelade
- Morphea
- Discoid lupus
- Folliculitis decalvans
- Sarcoidosis
- Follicular degeneration syndrome (hot-comb alopecia)

Table 4.

Focal, Non-scarring Alopecias

Entity	Distinguishing feature
Tinea Capitis	Broken hairs, scaling, erythema, positive smear and culture
Traction Alopecia	Typical Pattern
Patchy Alopecia Areata	History, exclamation point hairs, hair pull test, depigmented hairs
Secondary Lues	Serology
Triangular Alopecia	Pattern, configuration and history
Trichotillomonia	History, broken hairs present
AGA/FPHL	Pattern, hair pull test

Ancillary Tools

When it is not obvious whether the alopecia is diffuse or focal, one of the tools utilized is a *part width assessment* (Figure 5). This is performed by making a series of parallel parts one at a time and comparing the part width in different areas. If there is decreased part width throughout, the thinning is diffuse; if the part width is decreased in a localized area, then the alopecia is focal.

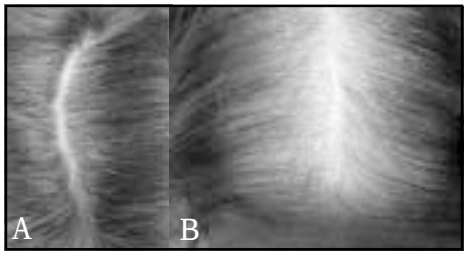

Figure 5. Part width assessment: a) normal part width; b) widened part with typical "Christmas tree" pattern of female pattern hair loss

Diffuse, non-scarring alopecia would be seen in telogen effluvium, diffuse alopecia areata, and the loose anagen syndrome. A list of non-scarring *focal* alopecias is presented in Table 4. These can be differentiated by unique clinical or laboratory features. Some also have a distinctive histopathology.

An important tool to assess diffuse hair loss is the *hair pull test*. This test is performed by gently pulling 50–100 hairs proximally to distally. This is repeated two to three times in different areas and no more than 5 telogen hairs obtained is normal. The hair pull test can confirm that abnormal hair shedding is actually occurring, and results can vary depending when the hair was last shampooed and combed.

In AGA/FPA, the hair pull test may be normal or elevated. If elevated, it will be so in "androgen dependent" areas and normal in "non-androgen dependent areas." In AGA/FPA, the proximal portion of the pulled hairs shows that they have the typical "club" structure of telogen hairs. In telogen effluvium, the hair pull would be abnormal all over the scalp and to a greater degree than in AGA/FPA. In anagen effluvium, the hair pull would again be abnormal throughout but one would see dystrophic anagen hairs characterized by tapered, broken proximal ends. In alopecia areata, inflammation develops around the anagen follicles and causes anagen arrest. The dystrophic anagen hairs obtained on a hair pull in anagen effluvium and alopecia areata show a tapered, broken tip of the proximal shaft. The hair pull test can also be used to follow the course of telogen effluvium.

Another way to confirm abnormal hair shedding is a *daily hair collection*. The patient is asked to collect all hairs shed daily for 7 days. Each daily collection is placed in an individual plastic bag and brought in to the office. An average daily loss is calculated and up to 100 hairs per day is considered normal. Although this test is difficult for patients to perform, it can clarify the results of a borderline hair pull test, assist in following the course of telogen effluvium, or help to

reassure a patient when results are normal.

The *hair feathering test* is used to detect fragile ends that usually result from chemical damage to the shafts from coloring, straightening, or permanents. Fragility can also be seen secondary to hair shaft anomalies, which are less common. The technique involves tightly grabbing the distal 2–3 centimeters of hairs between the thumb and forefinger and repeatedly pulling proximally to distally in different areas. Obtaining short hair fragments on the fingers constitutes an abnormal, positive test.

A *hair window* is utilized to evaluate patients who claim their hair doesn't grow (usually a feature of patients with trichotillomania). A 1 inch square area is clipped or shaved on a site of the head that is difficult for the patient to reach. The site can also he covered with an occlusive dressing. Hair growth is then observed over days to weeks. Normal hair growth rate is 0.4mm per day.

Microscopic Examination of Hairs

When the proximal ends of hairs obtained on a hair pull test are viewed under the microscope at 10× power, one will see telogen bulbs, abnormal anagen hairs, or broken hairs.

1. *Telogen bulbs* are seen in normal scalp, AGA/FPHL, telogen effluvium, and in late anagen effluvium (when all the anagen hairs have already been shed).
2. *Anagen hairs* are seen in anagen effluvium, alopecia areata (telogen hairs can also be seen in this entity), and the loose anagen syndrome.
3. *Broken hairs*, if seen, indicate that 10–20 hairs should be cut so that the *shafts* can be examined microscopically for structural anomalies.

The hair shaft anomalies are listed in Table 5. Their description can be reviewed in the appropriate texts and articles referenced below.

Microscopic examination can also be used to determine hair shaft diameter (caliber) and to differentiate miniaturized vs normal-size terminal hair shafts.

In cases where one wants to determine the anagen/telogen ratio, a *hair pluck test* can be performed. In this test, hairs are grasped using a hemostat with rubber-coated tips and 15–20 hairs are extracted with a quick pull. A total of 50 hairs are extracted and the proximal ends are examined under light microscopy.

Table 5.

Hair Shaft Anomalies
◆ Monilethrix (beaded hair)
◆ Pili torti (twisted hair)
◆ Trichorrhexis invaginata (bamboo hair)
◆ Pili annulati (ringed hair)
◆ Bubble air
◆ Trichorrhexis nodosa
◆ Trichonodosis (knotted hair)
◆ Trichoptilosis (split ends)
◆ Trichoschisis

Scalp biopsy is indicated in: suspected scarring alopecia, questionable alopecia areata, questionable trichotillomania, and any case of unexplained diffuse hair loss.

At least two specimens should be obtained: one for vertical and one for horizontal sections. Some dermatopathologists suggest that an additional third specimen from normal (uninvolved) scalp should be submitted. The specimens should be 4–6mm in diameter and include the subcutaneous tissue. The biopsy site is important. In cases of suspected scarring alopecia, biopsy the periphery of the alopecic area or wherever erythema and/or scaling are present. In alopecia areata, biopsy the area of most recent hair loss. The importance of submitting the specimen to a dermatopathologist with expertise in scalp pathology cannot be over stated.

Despite the perceived difficulty of evaluating hair loss patients, the physician should adhere to a systematic approach of obtaining a relevant history and performing a thorough scalp examination to formulate a differential diagnosis. When indicated, the diagnostic tools presented should aid in narrowing the differential diagnosis until the correct diagnosis is made. Only then can an appropriate treatment plan be instituted.✧

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CYBERSPACE CHAT...

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DENSE PACKING: A GOOD IDEA?

Samir Ibrahim, MD
Riyadh, Saudi Arabia

For the following reasons, it is important to give maximum density in one session:

1. The graft take in the first session is much higher than in following sessions.
2. It's more convenient for the patient to undergo one procedure only.
3. One cost.

30–40 FU/cm^2 with 1–4 hairs gives good density. Higher rates may compromise the blood supply and cause damage to the follicles. There are a number of studies (Mayer, Beehner) indicating that hair survival drops with higher rates of packing. Greater density can be achieved using a combination of follicular units and minigrafts transplanting 5,000–7,000 hairs in one session.

Catello Balsamo, MD
Castelnuovo, Italy

I don't think that dense packing is a good idea. I prefer to reserve donor hair for the future when enlarging baldness could show a different reality and I could find difficulty satisfying further requests.

Hair transplantation should be an insurance against baldness, nothing else. This is because we can never reach the original density. Dense packing should never be reaching the surgeon's record, but reaching the patient's care.

30–40 holes/cm^2 is likely to increase telogen effluvium in a patient with pre-existing hair.

Michael Beehner, MD
Saratoga Springs, New York

If you dense pack 3,000 FUs in the relatively small frontal region of the scalp, I have serious doubts that you can come back at a later session and dense pack the area behind it in the mid-scalp and enjoy the exact same robust hair growth results. First, all of this surgery at the first session in the more anterior scalp must surely result later in some degree of impedance to free blood flow from the supra-orbital/supra-trochlear blood supply. Secondly, I suspect that the first donor scar, along with the second excision to obtain the hair for this posterior area, has a slight negative effect on blood supply to grafts placed in the posterior half of the balding scalp. At least that is my impression over the years, owing to the fact that I have seen more cases of poorer-than-expected growth in the vertex region than I have in any other part of the transplanted scalp.

I think it makes more sense, if one's patient is a Norwood VI, to spread the grafts back to the vertex transition point, create a gradient of central density, and take 2–4 sessions to accomplish it. It gives him the option of stopping at any point in the process, it better respects the blood supply, and is easier and less heroic to accomplish for the staff and surgeon.

Vance Elliott, MD
Sherwood Park, Alberta, Canada

In 1997, when I was visiting his office, Jim Arnold described using a pen and moving it back on the scalp with the patient facing a mirror. When the patient loses sight of the pen, you have the "horizon" and should plan to restore at least 1cm beyond that. The patient then has a hairline and cannot see where posterior baldness begins. To do less in a N5 or greater stage leaves the patient with visible frontal baldness, which he won't like. To do more may be spreading things too thin and diluting the frontal results.

INTRAVENOUS SEDATION

Vance Elliott, MD
Sherwood Park, Alberta, Canada

1–2mg of sublingual Lorazepam gives little or no amnesia, provides only moderate anxiety reduction, and leaves patients sleepy after surgery. I prefer IV Versed for the profound amnesia, shorter action, and better patient relaxation.

When giving IV Versed 4–5 mg, I monitor O2 sat, HR, and BP and have never seen a problem with this initial dose. I do the blocks and donor harvest with the patient sitting up, which keeps the airway open. They will often sleep right through the ring block. After surgery they will be clear mentally and not hung over the next day, unlike with diazepam. They cannot drive sooner than 8 hours after the dose. The half life is 2 hours and drug clearance takes 6–10 hours.

Michael Beehner, MD
Saratoga Springs, New York

The benzodiazepine drugs work much better if at the same time you administer a narcotic such as Demerol. In my practice, assuming normal body size and age, I give an initial IV dose of Versed or Valium (2.5mg or 8mg, respectively), which is followed by Demerol 35mg IV. After a few minutes,

if the speech is clear and the O2 sat % is normal, I give an additional 1.5mg/5mg of either of the drugs. After the donor area is sutured, 1.5mg Versed and 15mg Demerol are given. Caution is required with the first dose of a benzodiazepine at the first session, as it can be very idiosyncratic in its effect for some patients. Any narcotic *potentiates* the benzodiazepine, so a smaller dose is required than when using a benzodiazepine alone.

Richard Shiell, MBBS
Melbourne, Australia

You must use a pulse oximeter if you're going to use IV medication. I prefer not to use narcotics as they occasionally cause nausea and patients cannot drive home afterwards. Half-life of Versed is two hours, so unless they have had a top-up mid-procedure, they are well enough to drive after four hours.

Some practices perform hair transplantation without the operating physician being in easy reach of the OR, so IV sedation would be very unwise. I have used IV sedation safely in over 12,000 hair transplant cases and although a reduction in the oxygen level is quite common, a command to simply "breathe up a bit" is all that is required.

Tony Mangubat, MD
Tukwila, Washington

Office anaesthesia is largely unregulated in the USA. While it is true that IV sedation makes for better comfort and happier patients and that most patients behave in a predictable manner, the problem is the potential for losing airway control. Those that cannot maintain their own airway can be injured despite the minimal dose of drugs. Preparation is the key to avoiding disaster:

1. Have an up-to-date crash cart.
2. Have the right equipment available.
3. Test the defibrillator daily.
4. ACLS certification
5. Be proficient at managing difficult airways. The most common error in office anaesthesia is loss of airway.
6. Have regular staff safety drills so everyone knows their job.

Edwin Epstein, MD
Richmond, Virginia

I think the potential risks from a reaction outweigh the benefits of IV sedation.

I give Xanax 0.25–0.5mg orally or sublingually, anaesthetise slowly and have very few patient complaints, and they drive home.

Sheldon Kabaker, MD
Oakland, California

We have an accredited facility that allows us to use IV sedation. All patients are monitored. My mixture is Versed 2.5mg, Demerol 25mg, and Ketamine 25mg. If someone is smaller than average, I will give half of the cocktail. There is always at least one ACLS certified nurse or physician in the room along with all necessary resuscitative equipment and medication.

The level of CO2 drives our breathing more than O2 levels. When people are chronically hypercapnic (high CO2), they are driven to breathe by O2 levels for ventilation. Supplemental O2 will stop them breathing!

PaO2 levels stay relatively high until a saturation of 90%. The oxygen saturation curve does not get steep until a PaO2 of 60 (= saturation of 90%). There is no danger in having a sustained oxygen saturation of 90%. Dropping below this becomes an issue.

Safety is our concern and we have to individualize our medication and monitor our patients within accepted guidelines, and be able to recognize and reverse serious side-effects from local anaesthetics and sedatives.

Sharon Philipson, MBBS
Sydney, Australia

These are excerpts from an article submitted to the New South Wales Medical Board regarding the use of anaesthesia for cosmetic purposes:

5.3 Simple sedation has been defined as 'administration of one or more medications which make it unlikely for the patient to lose consciousness or to have respiratory compromise.' It is expected that the doctor can 'maintain contact with the patient throughout the procedure.' To enable confidence in the ability of adjusting levels of sedation, only short acting, easily reversible medications should be used such as Fentanyl and Midazolam. These should be administered intravenously for optimum titration to the required level of sedation. Adjustment, if ever required, can be easily facilitated with the necessary reversing medications such as Naloxone and Flumenazil. It is important to note that Naloxone has a half-life of around 20 minutes and observation of patients that demonstrate a high sensitivity to any opiate, such as Fentanyl, should continue for at least one hour to check for re-emergence of toxicity after Naloxone has worn off. Subsequent doses of Naloxone may be required.

5.4 It is essential that patients are monitored for pulse oximetry, lead 11 ECG, blood-pressure and heart rate. Such monitoring should have hard-copy read out. Verbal contact with the patient should be maintained constantly to assess the level of coherence and reactivity.

Any facility providing simple sedation must have a fully equipped emergency trolley with a defibrillator and intubation capability. Intravenous access should be established prior to any procedure involving sedation of the patient.

Agents such as Propofol and Ketamine require additional expertise and practitioners should not use these medications unless they have a good knowledge of their actions, side-effect profile, interactions, and overdosing protocol. These agents are less easily reversed then Fentanyl and Midazolam and are more potent CNS depressives exposing patients to higher risk. Loss of gag reflex with concomitant inhalation of gastric contents with serious consequences or respiratory depression leading to hypoxia are the main concerns.

In most cases only small amounts of Fentanyl (<50mcg aliquots) and Midazolam (<5mg aliquots) will be required.

5.5 Increasing the level of sedation to overcome inadequacies of poor administration of local anaesthesia is a real concern and should be discouraged in

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Cyberspace Chat

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favour of delivering good initial local anaesthesia.

5.7 After the procedure the patient should be reviewed and deemed to be fit before being discharged into the care of a responsible adult, with written instructions that include driving prohibition for the day.

SPIRONOLACTONE

Robert Haber, MD
South Euclid, Ohio

I have used spironolactone in a number of patients and not been impressed. The dosage required is 50–100mg/day if any effectiveness is to be seen, and at this dose menstrual irregularities are quite common. This agent is a teratogen, and women of child-bearing potential need to be counselled and maintained on an appropriate contraceptive.

Jill Cargnello, MD
Melbourne, Australia

Spironolactone decreases production of androgens and is a competitive inhibitor of DHT, binding to its receptor. Clinical doses of 100 to 200 milligrams are required.

In one study of seven women treated with 200mg of spironolactone daily, six of the seven were pleased with the results at the end of six months and had an improvement of 41%.

The most common side-effects are irregular menses, mood-swings, breast tenderness, and decreased libido. Hypotension, particularly at the onset of treatment, and hypokalemia are potential side-effects but uncommon in the younger and middle-aged women.

Marty Sawaya, MD
Ocala, Florida

Excerpts from hairlosstalk.com.

The results of similarly conducted studies, all performed on hamster flank organs topically, seemed to show a superiority of gamma linoleic acid (GLA) over the established anti-androgens spironolactone and cyproterone acetate. 1mg of GLA produced flank organ reductions of between 50–66%, while spironolactone and cyproterone acetate produced a remarkably consistent average of about 35%.

I'm impressed by these numbers. A beneficial dietary fatty acid turns out to be more effective at inhibiting certain androgen dependent biological effects than a couple of powerful synthetic drugs, at least in this animal model.✧

Angela M. Christiano, PhD: Update in Hair Follicle Research: Implications for Gene and Cell Therapy

James L. Breeling (Summarized from "Brave New Hair: New Research and Surgical Techniques, 11th Annual Scientific Meeting, New York, NY, October 2003)

James L. Breeling, a professional medical writer and editor, is an independent consultant to the ISHRS and assisted the Forum *in covering several keynote talks at the ISHRS Annual Meeting in New York.*

Hair follicle research at cellular and molecular levels is not yet ready for clinical application, but has increasingly apparent clinical implications. This was a theme brought to attendees at the ISHRS 11th Annual Meeting in New York by Angela M. Christiano, PhD. Dr. Christiano, one of the world's foremost investigators of the hair follicle at cellular and molecular levels, is Associate Professor of Dermatology and Genetics & Development, Department of Dermatology, Columbia University, New York.

Dr. Christiano updated research in three areas:

1. Genetic approaches to identify new hair genes
2. Cellular approaches and stem cell plasticity
3. Combined cellular and genomic approaches in hair follicle induction

Genetic Approaches to Identify New Hair Genes

The mouse models *hairless*, *nude*, and *lanceolate hair* (lah) have become models for the genetics of human hair loss. All have been matched to human equivalents.

The *nude* mouse had been the best known of the "bald" mouse phenotypes, but human homologues were not identified until recently because affected humans were gravely ill from an accompanying immunodeficiency. A human equivalent of the *nude*/SCID (severe combined immunodeficiency) phenotype has been found to have a mutation of the *winged-helix-nude* (WHN) gene, which is expressed in the thymus. The clinical expression is a T-cell defect, congenital alopecia, and nail dystrophy.

The molecular basis of congenital atrichia in humans and mice has been identified with mutations in the *hairless gene*. The human form of total alopecia is inherited in an autosomal recessive pattern. The human *hairless* gene was found at the chromosomal region 8p12 and was cloned. In hairless mice, a premature and massive apoptosis in hair matrix cells and loss of molecular signaling between dermal papilla and stem cells in the follicular bulge appears to account for events that are expressed in the human as total or near total hair loss from scalp, eyebrows, eyelashes, and axillary and public areas. Several mutations in the human *hairless* gene have been identified in several countries in families with atrichia.

Atrichia with papular lesions (APL) also is an autosomal recessive disorder in humans. Hair loss is complete and irreversible over the entire body, starting after birth, and the affected individual also develops papular lesions of keratin-filled follicular cysts over large areas of the body. In patients from a number of countries, mutations in the human homologue of the *hairless* gene have been implicated in APL. A common theme has been a mutation that alters the amino acid sequence in the zinc-finger domain. The human *hairless* gene is believed to encode a transcription factor that has expression in brain and skin cells. The transcription factor has a role in regulation of apoptosis during the catagen phase of the hair growth/loss cycle.

The *lanceolate hair* (lah) mouse arose spontaneously in laboratory settings, producing a phenotype that closely resembles a human disease known as localized autosomal recessive hypotrichosis (LAH), and as Netherton Syndrome. The mouse is a model for the human disease. The autosomal recessive mutation was seen at the Pasteur Institute, Paris, in association with a mutagenesis experiment. Mice with the mutation had focal degeneration of hair shafts characterized by a "lance-head" appearance. Telogen follicles were near normal but catagen follicles had pronounced follicular dystrophy. A marked, persistent thickening of epidermis associated with ichthyosiform dermatitis resembled the features of the human disease.

In the Pasteur Institute mice and in mice at the Jackson Laboratory, Bar Harbor, ME, a spontaneous lah mutation was located on mouse Chromosome 18, in a cluster of genes near a cadherin (adhesion molecules) cluster. A mutation consistent with the mouse model has also been mapped to a region of human Chromosome 18 in LAH individuals from Pakistan.

The presence of cadherins—desmogleins and desmocollins—characterize the specialized cell-cell junctions known as desmosomes that are mediators of epidermal adhesion. Desmoglein 4 (DSG4) has been found to be expressed in the hair follicle and in suprabasal epidermis. It appears to be a mediator of keratinocyte cell adhesion in the hair follicle, coordinating transitions from proliferation to differentiation. This essential role of DSG4 was observed in identifying mutations in families with inherited hypotrichosis and in the lah mouse. DSG4 has also been identified as an autoantigen in acquired pemphigus vulgaris.

The importance of desmosomes in the hair follicle is suggested by the fact that 90% of the cell surface of hair follicle keratinocytes is covered with desmosomes. The complex infrastructure at cell-cell junctions actively participates in the transmission of signaling pathways that govern cell fate decisions—morphogens, bone morphogenic protein (BMP), sonic hedgehog (shh), winglesssint (Wnt), and receptor/ligands. The Wnt and hedgehog signaling pathways have long been

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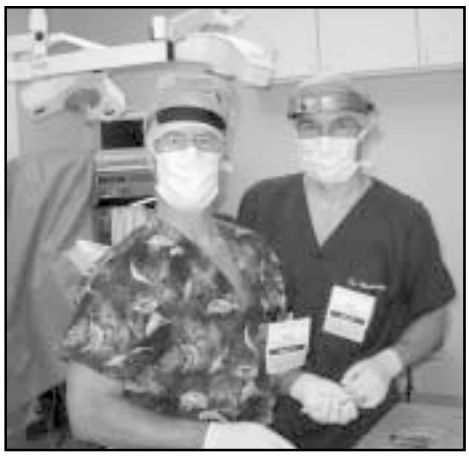
Meeting Review

Hair Surgery for the Cosmetic Surgeon
American Academy of Cosmetic Surgery
Seattle, Washington
June 26–27, 2004
Director: E. Antonio Mangubat, MD

William M. Parsley, MD *Louisville, Kentucky*

On June 25 and 26, Dr. Tony Mangubat held his first of what will hopefully lead into a set of annual meetings in Seattle. The main theme of the meeting was to assist cosmetic surgeons who had an interest in adding hair restoration to a multi-procedural cosmetic practice. Lectures were held in the morning and live surgery was performed in the afternoon on each day. Basic techniques in hair restoration and medical treatments of hair loss were presented along with some information on setting up an office. In addition, lectures were given on Botox®, other injectables, and cosmetic laser.

The live surgery workshops were particularly good. The State of Washington allows outside doctors with a current medical license to perform surgeries in this type of setting as long they don't plan to set up a practice in Washington. Due to an agreement with the patients, the attendees were able to get hands-on experience. The fact that the meeting was limited to 20 allowed personal attention. Invited faculty consisted of Steven B. Hopping, MD, and me. Experienced help in the surgical arena were provided by Robert P. Niedbalski, DO (Bellevue, Washington) and Steven P. Gabel, MD (Hillsboro, Oregon). Each day, three cases of hair surgery were performed. Repair sessions, follicular unit grafting, mini-/micrografting, stereomicroscopes, female transplantation, and the Impulse Graft Cutter were all demonstrated. The Meridian Instrument Company provided the meeting with an extraordinary microscope, a Nikon SMZ 800 with a 0°–30° adjustable eye tube, which was certainly a pleasure to use. Additionally, each afternoon included a 2-hour session on Botox techniques.



Steven B. Hopping, MD (L) and Robert P. Niedbalski, DO (R) preparing to start a surgical case for the hair transplant workshop

On Saturday evening, all of the faculty and attendees were guests at Dr. Tony and Susan Mangubat's new home on Lake Washington—with a beautiful view of Mount Rainier and Mercer Island. Further entertainment came with a sailboat cruise on the lake and music provided by the singing Mangubats (they were very good). Dr. Mangubat's first entry into hosting workshops was a home run. As an added bonus, all attendees received a copy of Dr. Unger & Shapiro's textbook, *Hair Transplantation*, 4th Edition. I expect the meeting next year will fill quickly, so watch for it. ✧

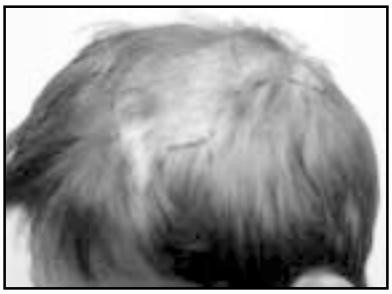
Hair Repair

case 6

patient M.C.

Vance W. Elliott, MD *Edmonton, Alberta, Canada*

This column presents cases of patients who have presented with different concerns and problems, requiring repair or modification. Cases selected illustrate the need for a creative approach to these problems using multiple treatment modalities, surgical and otherwise. Each case has been sent to a panel of surgeons with expertise in our field of surgery, and often in other fields as well. Their suggested management plans are presented and discussed here. Comments from the readership are invited, as well as cases for possible presentation. If someone has expertise in repair cases and would like to be a panelist, please notify me at vanceelliott@shaw.ca.



PRESENTING PROBLEM: This patient presents to discuss surgical options for improving cosmesis of a surgical scalp scar and area of post-radiation alopecia. He is currently wearing a hair system, which he finds troublesome to maintain.

HISTORY: The patient is a 17-year-old Caucasian male with a past history of a recurrent brain tumor successfully treated with 4 surgical resections and then radiotherapy. He has been disease free for more than 5 years. Medical history is otherwise unremarkable and there is no family history of AGA.

PHYSICAL EXAM: On examination, he has a surgical scar beginning in the left temple and arcing upwards and posteriorly into his crown. The scar is 6–10mm wide and on palpation is fixed to the underlying bone. There is an area of severe alopecia involving the upper left temple and left dorsum. Centrally in this area, an area of moveable skull plate approximately 6cm in diameter is palpable. According to his neurosurgeon, after multiple craniotomies in the same site, the bone stops fusing back together with the surrounding skull. The remainder of the scalp is normal, with good laxity.

James Arnold, MD
Saratoga, California

Age is of major concern in this patient in two ways. First, he is only 17 years old and we don't know if AGA will enter the picture later on. As we all eventually learn by experience, a negative family history of AGA doesn't count.

Second, the relative age of the irradiated scalp is of major concern. The effects of radiation are progressive over time. There will probably be a continued progression of change in this patient's radiated skin over the next decade. Most likely he will have progressive loss of the underlying subcutaneous fat, sclerosing and marked thinning of the dermis, further loss of hair, etc.

I would suggest waiting. I believe postponing corrective surgery until the further effects of his radiation can be seen and perhaps waiting until he is in his 20s to see if there is evidence of AGA. The history states he seeks hair repair because he finds his hair system "troublesome." The trouble he has with his hair piece may be minor compared with the trouble he may experience with transplants placed in an unstable field that is prone to change in a negative direction.

Bob Limmer, MD, Bradley Limmer, MD
San Antonio, Texas

We have done many cases of scarring in the scalp due to trauma, burns, surgery, radiation, and diseases producing cicatricial alopecia. This case of surgical and radiation induced alopecia should be expected to obtain a good restoration using follicular unit grafting since this has been our experience in all cases done during the past 16 years.

Martin Unger, MD
Toronto, Ontario, Canada

From the photographs, it appears that the area of alopecia involves primarily the middle and posterior thirds of the left dorsum of the scalp.

The surgical options for this patient from most conservative to most extreme are as follows:

1. Surgical revision of the previous surgical scar combined with combing the hair from right to left and letting it grow a reasonable length.
2. Same as #1 but in addition hair transplantation started 4–6 weeks (or longer if desired) after the scar revision. NB—great care would need

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Hair Repair

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to be taken in scalp areas under which there was no cranial bone (ample tumescence of the tissue and controlled depth of penetration by depth of receptor incision and angulation). In addition, the receptor sites would need to be spread out more than normally because of the poorer circulation in the flap tissue from the previous irradiation. Also, one should wait 6 months between transplants rather than the usual 4, again because of the previous irradiation.

3. Surgical revision of the previous surgical scar followed with serial scalp reductions (four months between reductions rather than three because of the previous irradiation). Combing from right to left as in #1 above.
4. Same as #3 above but adding either the Unger PATE or the Frechet extender to the process to decrease the total time and number of operations required.
5. Inserting one to three tissue expanders and surgical revision of the previous surgical scar if laxity permits in the first operation followed by chronic tissue expansion of non-irradiated tissue. One would need to examine the patient in person to determine the number and location of the tissue expanders. As in the other options, combing the hair from right to left.

The patient would need detailed information with regard to each option, and then would make his decision based on which option and its end result was most acceptable to him. Hopefully his financial ability would not interfere with his choice; however, if monetary problems were of concern, he could be referred to the ISHRS assistance program if the surgeon he was seeing was not already a part of that program.

Bessam Farjo, MD
Manchester, England

Considering his young age I would resist surgery despite the lack of family hair loss. I would counsel him extensively and encourage him to use camouflage instead of the hairpiece. Minoxidil may help but finasteride may not.

At the very most I may consider a small HT session around the parting on the left and the scar within the frontal forelock area. Another caution with the surgery is that he has what appears to be still significant hair in the area and there is potential for significant shock loss if significant surgery is done.

Vance Elliott, MD
Sherwood Park, Alberta, Canada

Options for improvement in this situation are as follows:

1. Continuing the use of the hairpiece as camouflage.
2. Surgical excision of the scar and revision to reduce its size and make concealment easier. Once healed, one could perform grafting into the scar and surrounding alopecic scalp
3. Excision of the scar and as much alopecic scalp as possible using volumetric or non-volumetric tissue expansion with grafting as needed as a final step.
4. Grafting only to the scar and surrounding areas.

The most simple and least risky option is the hairpiece. The procedure likely to make the most significant improvement in the shortest amount of time is scar revision, presuming one could achieve an improvement. However, simply improving the scar will not change the need for the hairpiece, and so on its own would not be worthwhile.

Planning of any surgery is always at risk should he develop AGA later in life and this must be considered in graft and scar location.

Any surgical approach in this young man would require multiple procedures, whether grafting or excision, both due to the size of the area involved and the need to be conservative because of blood flow to the area. The vasculature would certainly have been compromised somewhat by past surgery and radiation.

Grafting the area has the advantage of less pain and deformity than tissue expansion, but would still require a series of procedures.

Theoretically, expansion of the normal scalp and subsequent excision of the radiated scalp may be more successful than depending on grafts to grow in the compromised scalp. Of course, this would mean patient acceptance of the temporary deformity caused by expanders. This would also require consultation with the Neurosurgeon to ensure safety.

Ultimately, contemplation of the complex surgical plan needed to reconstruct this area may not be appropriate for a 17-year-old and more time may be needed. A hairpiece is an invaluable aid to him and may be all that is appropriate now.✧

"The bitterness of poor quality is remembered long after the sweetness of low price is forgotten."

—John Ruskin

Response to Hair Repair Case #3

Steven C. Chang, MD *Newport Beach, California*

This patient (*Forum*, Vol. 13, No. 3, 2003; p. 355) has two main concerns: 1) the huge scar size of the donor site, 14cm × 2.5cm, and 2) the "grafty" appearance from his previous hair transplants.

From Dr. Elliott's information and pictures, we understand that the patient's occipital scalp has very little laxity and the temple and supra auricular area has excellent density and laxity. To treat this patient, let us treat the scar at the occipital area as if it were a scar at the top of the head. Then everything would be much less complicated because we do this type of procedure every day and we have a lot of experience in transplanting over the scar area, where we know the success rate is excellent. I do not see any reason why we should treat the occipital area different.

First, we should find out how much donor site is still available for us to use. From the picture, I estimate that the patient should have a donor site around the size of 10cm wide by 30cm long (the average person has about 30cm long donor length). The scar is 14cm long, so we still have 16cm available (30cm – 14cm = 16cm). Also, a 10cm wide donor site means we can use at least 5cm of this width for hair transplant purposes. It means the total area available for the donor site is at least 80cm^2 (5cm × 16cm). In addition to that, 1–2cm above or below the scar should have looser laxity than the scar area, which might be useful if more procedures are needed later in his life. The scar is 14cm long by 2.5cm wide; therefore, the area is 14 × 2.5 = 35cm^2.

Using 50% density as our goal for hair transplantation, we only need to use 17.5cm^2. This is less than ¼ of 80cm^2. There should be no problems in achieving this goal. For this patient, however, because hair overlap in the occipital area is better in the back than in the front top area, we do not even need 50% density to please the patient.

35cm^2 is actually a very small area for hair transplantation. My recommendation for treatment would be to perform two surgical procedures along with prescribing Propecia®. I would start to perform the hair transplant by first cutting 8cm × 1cm from each temple and supra-auricular area. The cut will line up to the bottom of the scar, and connect the scars together so that after the surgery it will look like one long scar instead of three small separate scars. The total donor area is 16cm^2, while the coverage area is 35cm^2. I would transplant 25% of the density and thus will need 25% of 35cm^2, which is 8.75cm^2. Scar tissue always has a limited circulation so I will use follicular units only. From the 8.75cm^2 donor strip, I will cut that into about 875 grafts, and still have about 7.25cm^2 left over.

Case 3. Scar pictured on left; top on right

Pattern of transplantation: Denser at the top of the scar, while toward the bottom, density is gradually reduced, thus treating the top of scar as one would the hairline.

Direction of hair: Very sharp angle, similar to the surrounding hair.

Position of transplant: The prone position would be acceptable; however, the table may take up too much space and be hard for storage, so we recommend using a *massage chair* instead (Figure 1). Both technicians can sit down and approach from each side (Figure 2).

Using my plan to treat this patient, we do not even need to do any scar revisions for these reasons:

1. The numbers of hairs is fixed. The size of the head never changes. Even if we do not consider the stretch back, the surrounding hair density will be reduced.
2. With scar revision, there is a possibility of damage to the micro circulator that will impact the new transplant area.
3. The coverage area is only 35cm^2, a very small area in hair transplant standards.
4. Scar revision may also cause hyperplasia to the scar.

Figure 1.

Next, I would begin to correct the patient's second concern, the "grafty" appearance. The "grafty" look is produced from uneven density. If we were able to fill in all the empty spaces, to make the density even everywhere, then the "grafty" look will disappear. I do not believe in removing the big grafts. Instead, I believe the big grafts help us to achieve the patient's goal. How much density should we transplant to produce a more natural look? The answer is 50%, because at 50% density, it is hard for the

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Figure 2.

Response to HR Case 3

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human eye to tell the difference between 50% and 100% density of hair. The leftover donor strip of 7.25cm^2 will be used for this purpose. The size of the grafts will be 1mm × 2mm. So we will be able to cut the donor strip into about 360 grafts, covering up to 30cm^2.

In addition to the hair transplant procedures, I would encourage the patient to take Propecia®, because it may grow some hair to reduce the "grafty" look. Further treatment for the "grafty" look needs to be reevaluated 6 months later after examining the results of transplanting the recipient area and looking at the effects of Propecia.✧

Update in Research

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known to direct growth and patterning during embryonic development, and recent evidence implicates them in postembryonic regulation of stem cell number and development in tissues such as epithelium that undergo constant renewal.

Potential therapeutic applications for hair growth genes have yet to be realized, Dr. Christiano said. Genes involved in diseases affecting millions of people, such as alopecia areata, have yet to be identified. In the case of alopecia areata, it is generally accepted that a complex combination of genetic and environmental factors results in a typical phenotype. Studies that seek to identify the relevant genes are under way.

However, the genes involved in the *hairless* and *nude* models, and in DSG4, could be excellent targets for development of hair removal and hair inhibition agents.

Cellular Approaches and Stem Cell Plasticity

Recent work, Dr. Christiano said, has shown remarkable plasticity in neural, hemotopoietic and muscle stem cells, depending on environmental stimuli. Much less is known about the potential for epithelial cell reprogramming.

Epithelial cell reprogramming has shown promise as a cellular approach to tissue engineering. The first evidence that a distinct (and presumably irreversibly committed) population of transient amplifying (TA) cells can be reprogrammed was provided by Ferraris et al [*Ferraris C, Chevalier G, Favier B, Jahoda CA, Dhuoailly D. Adult corneal epithelium basal cells possess the capacity to activate epidermal, pilosebaceous and sweat gland genetic programs in response to embryonic dermal stimuli. Development 2000; 127:5487-5495.*]. The investigators showed that adult rabbit central corneal epithelial cells can be reprogrammed into skin with sebaceous glands and hair follicles. The rabbit corneal epithelium was associated with mouse embryonic tissue, then grafted onto nude mice. The corneal cells responded to signaling from embryonic dermis, and gave rise to a new basal stratum, then to pilosebacous units or sweat glands, and to upper layers expressing epidermal-type keratins.

More recent work summarized by Dr. Christiano showed that both cornea and amnion can be reprogrammed by methods similar to those used by Ferraris et al. Potential therapeutic applications for epithelial reprogramming include providing epidermis for patients with inherited skin diseases such as ichthyoses where the epidermal compartment is defective.

Also, Dr. Christiano pointed out, the plasticity of epithelial and dermal cells of the skin to become osteoblast, adipose, neural and muscle cells suggests that hair follicles could become an easily obtainable source for adult multipotent stem cells for cell-based therapies. The presence of stem cells in the bulge area of the follicle has been a subject of intense investigation.

Hair Follicle Induction: Combined Genetic and Cellular Approaches

The plasticity of dermal papilla cells has been recognized for two decades, since Colin Jahoda and colleagues reported induction of hair growth by implantation of dermal papilla cells. The dermal papilla is known to be critical to hair growth. While it is related biologically and anatomically to the dermal sheath of the hair follicle, investigation has shown a critical difference in regard to inductivity: the dermal papilla is in direct contact with overlying epithelial cells while the dermal sheath is not.

Ear skin wound assay of dermal papilla and dermal sheath cells has shown that 1) both are inductive when freshly dissected and in early passage, 2) both lose inductivity in late passage, and 3) inductivity can be restored by co-culture with epithelial cells.

Dr. Christiano described the hypothesis that was developed to pursue further investigation:

- Gene expression comparison of dermal papilla versus dermal sheath wound identify genes where expression is interaction-dependent or inductive, and is lost upon explant culture.

Emerging from the subsequent microarray analysis of sample populations of freshly dissected mouse dermal papilla and dermal sheath was discovery of interaction-dependent expression of a novel gene, uterine sensitization-associated gene-1 (USAG-1) in dermal papilla. USAG-1 has been identified as a gene associated with successful implantation of the blastocyst stage of the embryo. It belongs to a small cysteine-knot containing gene family that to date has only one other member—a gene called SOST that appears to encode a regulator of bone homeostasis.

USAG-1 has a novel WNT signaling fuction that is mediated by the binding of a secreted frizzled-related protein (sFRP2). The Wnt4/USAG-1/sFRP2 axis has potentially an important role in many epithelial-mesenchymal (ectodermal-mesodermal) interactions during vertebrate development and organogenesis. USAG-1 has been found to be highly conserved in vertebrates.

The findings regarding USAG-1 have implications for understanding the underlying basis for hair multiplication, and for therapeutic applications of hair multiplication. The implications are even more broad for understanding and treating human genetic disorders of hair growth and loss, for developing more elegant mouse models, and for conducting functional studies.✧

Once Upon a Time…

"The debate about megasessions continues and is becoming personalized with the emergence of champions for the varying points of view. It is the position of the 'megasessionists' that scalp, with its superabundant blood supply, can accept, grow and mature far more hair per procedure than was heretofore believed…. However, there is significant research and clinical evidence to suggest that MPB scalp does not, in fact, have superabundant blood supply. (He cites studies by Klemp, Toshitani, Goldman, and D. Stough.)… *Some inferences seem justified. It is probably that thicker scalps are more vascular than thin scalps and. consequently are more amenable to megasessions. It is also likely, if not certain, that the maximum number of grafts should be done at the initial transplantation session, since in subsequent sessions the tissues will be relatively more hypoxic and as such will be less receptive to hair transplantation….There is still a long way to go before all questions are answered."*

Gerard Seery, MD (Vol. 6, No. 1, January/February 1996; pp.16–17) in an article titled "Worries About Megasessions."

• •

"Alopecia reduction promised much, was deceptively simple to perform, and was accepted with joy and acclamation by almost all hair surgeons worldwide as an answer to the vexing problem of how to improve the ratio of donor to recipient hair supply…. The baby grew rapidly, but the first signs that the infant might have delinquent tendencies were noticed at the Transform Medical Group in England…. Complaints of visible scars, distortion of the hair margins, acceleration of hair loss and a condition termed "stretchback" were noted and published in 1983."

Richard Shiell, MBBS (Vol. 6, No. 2, March/April 1996; pp. 1–2) from article entitled "Alopecia Reduction Revisited."

• •

"The method of multi-bladed knife donor harvest with narrow blade spacing combined with preset razor blades mass cutting of grafts (1mm spacing) as proposed again recently by Mangubat, but done earlier by others, is nothing less than follicular holocaust, as not less than 50% of he follicles will be transected in my opinion. The unfortunate "feeling" among many in the industry is that most of these follicles grow, even if cut, which is not supported at all by the literature (Kim, Jahoba, Limmer)."

Bobby Limmer, MD (Vol. 8, No. 5, September/October 1998; p. 11) in "Letter to the Editor."

Letter to the Editors

Doing Away with Incision Length

Thomas C. Nakatsui, MD FRCPC
Edmonton, Canada

I read with interest the article by Dr. Walter P. Unger concerning web sites related to hair loss and treatment in the January/February 2004 (Vol. 14, No. 1, p. 17) issue of *Hair Transplant Forum International*. I found that I agreed with most of his points, as informational web sites are often biased in one way or another, particularly if there is some financial incentive, whether through advertising or product sales.

I also agreed with the statement that follicular units generate more natural results than prior techniques. However, I believe his point concerning the cumulative length of incision from needle pokes is deceiving. One of his fundamental premises is that large numbers of small incisions create a large, cumulative incision length. For example, he states that "3,000 [18-gauge needle] sites in the frontal area represents 15 feet of incisions." Based upon this premise, the inference is that this large cumulative incision length corresponds to a higher degree of vascular damage than non-follicular techniques, which would lead to a less desirable result than non-follicular techniques.

While there is vascular damage with any incision, I believe this argument is misleading in some ways. While the premise that large numbers of small slits does represent a large cumulative incision length, I believe the incision length is a deceptive marker of vascular damage. At the very least, we should discuss this issue in terms of incision *volume*, even though this too is likely an insufficient marker of trauma and vascular damage.

The easiest way to illustrate this is to use chisel blade incisions and square punches. I realize that no one uses square punches but this makes the argument easier to understand. For the sake of argument, let us also assume the depth of incision is always 4mm, no matter which type of recipient site is created and hence this is constant.

Let us compare incision length and incision volume for three types of recipient sites: 1mm slits, 1mm punches, and 4mm punches (Table 1).

	1mm Slit	1mm Punch	4mm Punch
Horizontal length (H)	1mm	1mm	4mm
Vertical length (V)	.25mm	1mm	4mm
Incision depth (D)	4mm	4mm	4mm
Incision perimeter[2 × (H+V)]	2.5mm	4mm	16mm
Incision volume(H × V × D)	$1mm^3$	$4mm^3$	$64mm^3$
Incisions/cm^2	50	15	2
Cumulative incison perimeter	125mm	60mm	32mm
Cumulative incision length	50mm	15mm	8mm
Cumulative incision volume	$50mm^3$	$60mm^3$	$128mm^3$

Table 1.

From this example, one can see that if we place fifty 1mm slits in $1cm^2$ and fifteen 1mm punches in the same area, the cumulative incision length for the slits will be much greater (50 vs 15), yet the cumulative incision volume for the slits will be less (50 vs 60). Clearly, these two indicators tell two completely different stories. Moreover, even though most of us would agree that a single 1mm punch is more damaging than a single 1mm slit, it is interesting that both have the same incision length, yet the incision perimeter and incision volume are different. Furthermore, most of us would agree that two 4mm punches would create much more damage than either fifty 1mm slits or fifteen 1mm punches. However, the cumulative incision length for two 4mm square punches is only 8mm, significantly less than the other incisions, yet the amount of damage is significantly more. Clearly, incision length is not a good indicator of damage to the skin. Interestingly, if we assume that cumulative incision volume is a valid correlate of trauma and vascular damage, then we can see how 50 slits per square centimeter would be *less* traumatic than 15 punches per square centimeter.

Another way to illustrate this is by comparing how many slits it would take to produce a punch of the same size. For example, using the hypothetical dimensions stated above, we could produce a 1mm punch using a 1mm slit by apposing 4 slits immediately adjacent to each other, as shown in Diagram 1. Using this example, the cumulative incision length for the slits would be 4mm, whereas the cumulative incision length for the punch would be only 1mm, and yet the dimensions of each set of incisions would be identical. Why this disparity? In this example, even though one punch would produce an incision that would be identical to 4 slits, the cumulative incision length will be 4 times larger for the slits. Again, it is apparent that cumulative incision length is a deceptive marker of trauma or vascular damage, whereas cumulative incision volume correlates precisely.

By extension, it is also apparent that it would take 4 slits for every 1 punch (given the hypothetical constraints of this example) to produce an equivalent volume of damage. Again, by extension, 800 of these punches would be equivalent to 3,200 slits.

Based upon these arguments, I believe we should cease using cumulative incision length as a marker of trauma or vascular damage in any of our discussions with patients and with each other, as it is deceptive and misleading. At the very least, we should discuss this in terms of cumulative incision volume or perhaps a better value would be the incision volume density, which could be defined as the cumulative incision volume per cm^2. I believe the latter of these values would give the reader a

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Letter to the Editors

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much more accurate correlate of trauma and vascular damage, and would take into account the depth of the incision, which many believe to be of critical importance, as well as the density of the incisions. Arguably, this is not a *precise* valuation of trauma or vascular damage, and does not take into account critical issues such as depth of the vascular plexus but does give the reader a much less deceptive impression than discussions of cumulative incision length.

My thanks to Dr. Jerry Wong for reviewing this text.✧

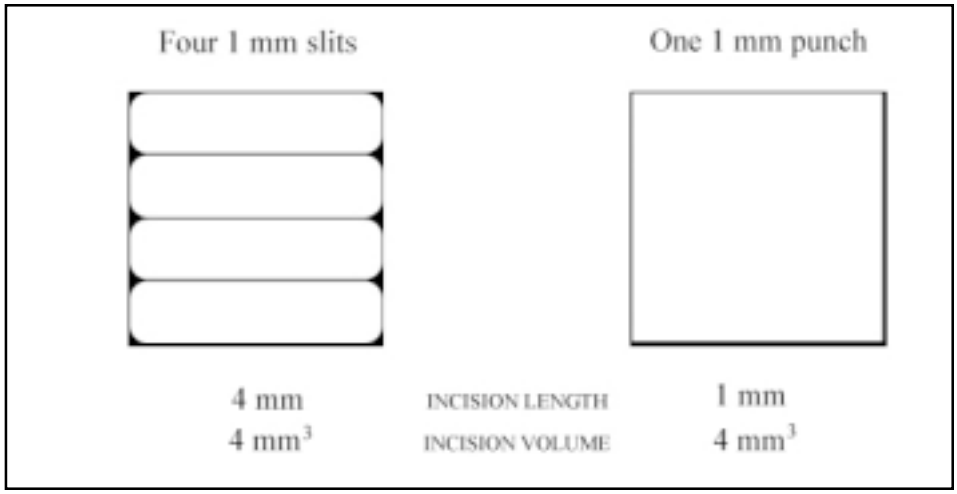

Diagram 1.

Surgical Assistants Corner

Office Techniques of Drs. Hasson and Wong

Christina Wardroper, Clinic Manager for Drs. Hasson and Wong *Vancouver, BC, Canada*

Back Row: Tatum Wulff, Marion MacKay, Alejandra Rodriguez, Sylvia Paterson, Paula Jost, Jodi Agerbo, Slava Plackova, Rebecca Williams, Vida Salvador
Middle Row - Leena Kumar, Loanne Nguyen, Angie Roma, Michi, Farhana Ali
Front Row - Mike Roma, Lovelee Lumbres, Trish Brwon
Not Pictured - Rie Rice, Karen Morrow, Jane Parfitt, Anna Carney, Vanessa Jvrado

Introduction

Our office officially began in April of 1997, when Dr. Jerry Wong and Dr. Victor Hasson joined their hair restoration practices. Dr. Wong had been in family practice for nearly 20 years before deciding to enter hair restoration in the early 1990s. He started by training under our current President, Dr. Mario Marzola, in Australia. Dr. Hasson also came from a family practice setting and did his hair restoration training in North Vancouver under Dr. Garth Dorman.

We have grown into a bustling practice. Dr. Wong and Dr. Hasson each have 11 medical technicians. The office contains 4 operating rooms and we can perform up to 4 surgeries per day. The office is located in Vancouver's medical district overlooking the downtown core and surrounding mountains.

Technique

Our office performed mini-/micrografting until about 4-5 years ago, when we started slowly adding microscopes. We began with 2 binocular scopes, but at the 1999 ISHRS Annual Meeting in San Francisco, we saw the Mantis scopes for the first time and felt that this was the scope for us. We have been fully microscopic for 4 years. We decided on the 6× magnification. The scopes are mounted into the desktop so the there is no raised platform. Since starting with the Mantis, we have had no repetitive strain injuries from dissection.

For slivering, we use Personna double edged blades snapped into a plastic holder. The strips are placed on moistened Clinisorb over a moistened tongue blade, and grasped with jeweler's forceps—half the staff uses curved forceps and the other half uses straight. The grafts are then cut into follicular units and placed onto Clinisorb in a chilled Petri dish. The FUs are sorted into piles of 10 for organization and counting. In planting, most techs use a 45? fine jeweler's forceps (Robbins #815) and place up to 10 grafts on their gloved fingers. All grafts are kept moistened with chilled normal saline.

Our cases tend to be larger than most clinics, occasionally performing cases of greater than 5,000 grafts in one sitting. We require the mega-session patients to have the top of their heads shaved in order to make the procedure smoother and faster. The donor area is closed with deep Vicryl sutures and staples (Wong) or by staples alone (Hasson).

The most significant technique utilized in our office is the technique of lateral grafting, also known as coronal angled grafting (CAG). The recipient incisions are made using cut Personna razor blades (0.6–1.2mm) oriented 90° to the intended hair direction of the graft. This is felt to be anatomically natural and gives more effective coverage. Also we tend to transplant the temples more frequently than do other offices, as we feel it is rewarded by a fuller look.

Tips

1. Consider the Mantis scope for magnification, particularly if you are having problems with overuse injuries. It has a 0° eye angle to the horizon.
2. Quality first, then speed. We require newcomers to cut good-quality grafts from the start and not to worry about speed at first. Usually, a technician is fully trained in 6–12 months.
3. Always keep grafts moistened. You can't hear that too many times.
4. Placing the patient in a prone position while planting the downward slope of the crown makes the implant much easier and ensures that the technicians maintain good posture.
5. Don't place too many grafts on your gloves at one time. This is a major source for drying of grafts.

We look forward to seeing everyone in Vancouver.✧

From left to right: Joe Tillman, Christina Wardroper, and Doug Kline

Editor Emeritus

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when the tension on the suture line is virtually zero. Removal of these scars usually results in an identical scar, whatever suture method is used.

5. This subset also gets wider than normal circular scars when the FUE technique is employed but the cosmetic effect may be preferable to another wide horizontal scar.

We cannot agree on whether scars should be routinely removed with second and succeeding operations or "stacked" one on top of the other 1cm apart like layers of meat in a "Big Mac" hamburger. Because eminent surgeons can be found in support of either system, it is most likely that both are equally effective if the cases are carefully selected and well managed and both equally disastrous in patients with "stretchy" donor sites.

What is urgently needed is a reliable method to identify the members of the poor scar subset in advance and thus prevent the formation of most wide donor scars. It is not enough to mutter platitudes about *"the avoidance of tension"* and the importance of *"two layer closures"* as we experts seldom take wide donor strips or close under tension, yet we see a small number of our own poor scars as well as those of other experienced surgeons.

Some surgeons doggedly press on with further transplant procedures when it is apparent after the first procedure that there is going to be a problem with donor scarring. The wise surgeon will, at this early stage, have a serious talk with the patient and discuss further management. Now that most grafting is with minigrafts or FUs, it is possible to abandon further strip surgery before the removal of additional horizontal strips from the donor site produces an unsightly and probably untreatable mess.

There is also an urgent need of a foolproof method to manage these scars when they present in consultation and post-operative follow-up. Too much lip-service is paid to *"scar excision and tension-free closure"* when we know that this procedure has a largely "placebo" effect in most cases, and especially when the initial surgery was performed by an experienced surgeon. "W-plasties, Nordstrom Sutures, and Tissue Expanders" are all frequently advocated by their respective adherents. No doubt all are successful at times but the results of a large series of sequential cases have NEVER been presented. Until such a series is presented, all such remedies must be regarded with caution.

See you in Vancouver.✧

Richard Shiell, MBBS

Parsley Message

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Sites are made with ultra-sharp cut razor blades and their results are very good, sometimes outstanding. At this meeting we will get a chance to see examples of their work, along with work of several other highly skilled doctors, at the live patient viewing Friday, August 13. The following day, Dr. Wong (along with Dr. Pathomvanich, displaying his donor dissection) will demonstrate this lateral, or CAG, technique as one part of the Live Surgery Workshop. The Live Surgery Workshop has always been the top draw for meeting attendees. There are three other surgeries being demonstrated: Dr. John Gillespie demonstrating follicular unit grafting with sagittal sites, Dr. Tony Mangubat demonstrating his clever and fast Impulse Force technique, and finally Drs. Shelly Kabaker and Andrew Dentor lowering the frontal hairline of a woman. Because he shuns the spotlight, some of you may not know much about Dr. Gillespie; but make no mistake about it—he is one of the best in the business and his demonstration will be most informative. One disappointment, however; for the second straight year, no follicular unit extraction (FUE) demonstration will be performed, in spite of Dr. Epstein's efforts.

After a long wait, the textbook that has become the ultimate single source of information, *Hair Transplantation*, has finally been released. Co-authored by Drs. Walter Unger and Ron Shapiro, it is the most comprehensive textbook to date, and is a must for anyone calling themselves a hair restoration doctor. On page 128 of this issue of the *Forum* is a review of the textbook by Dr. John Gillespie. This is the 4th Edition, the first being published in 1979, and one has to wonder how Dr. Unger maintains such energy and endurance. Let's hope there will be a 5th edition, but don't suggest it to him just yet.✧

William M. Parsley, MD

Beehner Message

continued from page 123

before deciding what to do. Several benefits accrue from having the majority of your practice patients come from nearby. For one thing, each of these patients has had a personal consultation with you well before the date of the surgery, so their decision to go ahead is far more likely to be well thought out and the bond of trust between you and him or her will be stronger. It gives you the opportunity to make sure that each patient you operate on is a sane and reasonable person. These patients are much more likely to actually show up on the day of surgery, and their check is less likely to bounce. The word-of-mouth ricochets around your area amongst the hair-impaired populace, in the hair salons and doctors' offices in which your patients' attend, in their work-places and social gathering spots—all of which builds a general awareness of your presence in that community and assures you a steady future supply of patients. I forgot the biggest benefit of all: If you can somehow stay busy enough to not have to travel to distant cities to operate, you simply have to make the short drive to the office every day to start work. I do realize that for some physicians such travel is necessary in order to stay working full-time in the field of hair transplantation that they love.

On research in hair transplantation:

Without question, we hair transplanters are a small group. I am surprised more people don't take the time or have the curiosity to conduct more studies, both to get to the bottom of something they may have been wondering about, or simply to become more involved with the academic side of our specialty. I'll never forget back in 1994 when I wrote a small personal letter to O'Tar Norwood, the then editor of the *Forum*, asking why there wasn't any mention at the Toronto ISHRS meeting about the frontal forelock idea (I even specifically told him I didn't want my letter published!). Several months earlier, I had heard a talk in San Antonio by Manny Marritt on the subject and thought it was the greatest idea since sliced bread. I simply wanted an answer from someone that I thought might know. Well, anyway, O'Tar, being the good editor that he was, responded by asking *me* to write an article summarizing *my* thoughts on the subject and how I was using the forelock in my practice. He then puts this 6-page article by a complete neophyte on page one! I still cringe when I look at the ghastly photo with the large 3.5mm holes in the forelock's center, which he put right dab in the center of the front page. Anyway, from that moment on, for some reason people assumed I must be an "expert." This was flattering and humbling at the same time, and at least motivated me to learn more and become better at my craft, so that I could meet that expectation in some modest way.

Returning to the subject of doing research in hair transplantation, when someone sets up a study, usually he or she has some notion of what is likely to be the result, and I must confess that it is both fun and disconcerting at the same time to later learn, as a study comes to an end, that your initial assumption (or even the *bias* you may have entered the study with) was all wrong and that the opposite was in fact true. This happened to me when I tried to find out if limited depth recipient sites grew more hair than deep ones. To my surprise, I found superior growth when the recipient sites were *deep* down near the galea compared to those that were minimal depth, barely penetrating the superficial subcutaneous level. In the same study I compared minigraft and FU growth and expected the minigrafts to look much denser than the FU zones, but, after three sessions, I couldn't really SEE a visible difference between them (although the hair count survival percentage was higher with the minis). I found out that an open mind is a requirement for doing research and makes the whole enterprise more fun!

See you all in Vancouver.✧

Michael Beehner, MD

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THE FUE MEETING OF THE YEAR. IS STRIP HAIR TRANSPLANTATION DEAD?

Over 10 Live FUE patient results will be presented, including a U.S. based 10,000 FUE result.

We are pleased to announce the Preliminary Program of this year's annual Aegean Masters Meeting which will focus on Follicular Unit Extraction.

A combination of live surgery showing the DHI placement techniques, an outstanding social program and an unforgettable four day Aegean Islands Cruise stopping in Mykonos, Kusadasi (Turkey), Patmos, Rhodes, Crete and Santorini, where lectures will take place while on board the Olympia Countess cruise ship

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Upcoming Events

Following is a guide to upcoming meetings and workshops related to hair restoration. For more information, contact the appropriate sponsoring organization at the number listed. Meeting organizers are reminded that it is their responsibility to provide the *Forum* Editors with advance notice of meeting dates.

Date(s)	Venue	Sponsoring Organization(s)	Contact Information
Academic Year 2004–2005 November 18–20, 2004, January 20–22, 2005, March 24–26, 2005, and May 12–14, 2005	Diploma of Scalp Pathology & Surgery University of Paris VI— School of Medicine *Paris, France*	Coordinators: P Bouhanna, MD & M. Divaris, MD Director: Pr. J. Ch. Bertrand	Phone: 33 +(0)1+42 16 12 83 Fax: 33 +(0)1+42 27 12 05 E-mail: marie-elise.neker@admsto.jussieu.fr
August 11–15, 2004	12th Annual Meeting of the ISHRS *Vancouver, BC, Canada*	International Society of Hair Restoration Surgery *www.ishrs.org*	Tel: 630-262-5399; 800-444-2737 Fax: 630-262-1520
August 15–22, 2004 STILL ROOM— Post-Meeting Alaskan Cruise	ISHRS Post-Meeting Alaskan Cruise *Royal Caribbean Cruise Line*	International Society of Hair Restoration Surgery through UNIGLOBE Advance Travel Fresh air and fresh ideas in Hair Restoration VANCOUVER	Leisure Department at UNIGLOBE Advance Travel Tele: 604-688-5835; toll-free: 888-463-2757 e-mail: vacation@uniglobe-advance.com.
October 3–8, 2004	2004 Aegean Masters FUE Meeting Oct. 3 Live Surgery Oct. 4–8 Aegean Cruise *The Aegean Islands, Greece*	The DHI Clinic *www.aegeanmasters.com*	Carolina or Olympia Tel: 30-210-9245297 Fax: 30-210-9249378 E-mail: info@dhi.gr
August 24–28, 2005	13th Annual Meeting of the ISHRS *Sydney, Australia*	International Society of Hair Restoration Surgery *www.ishrs.org*	Tel: 630-262-5399; 800-444-2737 Fax: 630-262-1520

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