HAIR TRANSPLANT forum INTERNATIONAL

INTERNATIONAL SOCIETY OF HAIR RESTORATION SURGERY

Volume 19, Number 1
January/February 2009

One hundred follicular units transplanted into 1cm² can achieve a survival rate greater than 90%

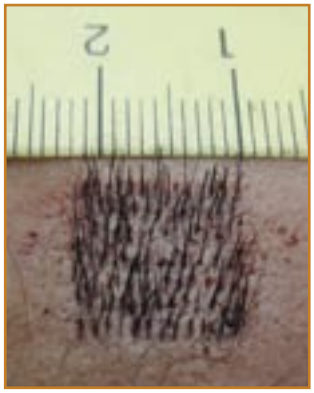
Akaki Tsilosani, MD, PhD *Tbilisi, Georgia*

The effectiveness and naturalness of the results of follicular unit (FU) transplantation is well proven, but the problem of hair growth yield with dense packing is a concern for many surgeons. How densely can the grafts be packed without harming their survivability? This issue has become the object of debate in recent years, especially in the era of megasessions when lots of clinics around the world offer the possibility of transplanting large quantities (3,000-6,000) of FUs in one surgery. Six years ago, when we attempted to increase the density of transplanted grafts with the purpose of achieving more natural results, the safe density for the survival of grafts was considered to be 25 FUs per cm². The research of Mayer, et al. indicated that the implantation of more than 30 FUs in 1cm² might reduce hair growth by 20-30%.[4] It was postulated by others that the insertion of 40 or more FUs into 1cm² could reduce graft survival because of compression.[3,4,7]

What is the reason for the reduction of graft survival, if it really occurs, in the circumstance of dense packing? As a result of analyzing this problem, we can list four possible factors:

1. "Lateral pressure" on the implanted grafts in very small recipient sites
2. "Ultra fine" preparation of grafts, leading to the absence of tissue around follicles, or artificial splitting of FUs with the purpose of enabling their implantation in smaller sites
3. Crush injury of grafts when assistants push them into small recipient sites
4. Violation of blood circulation in the recipient site by excessive incision density

Mechanically, high density cannot be achieved without reducing the size of recipient sites. In our opinion, implantation in small recipient sites, the sides of which tightly press grafts and provide maximum contact of the implant with the surrounding tissues, is optimal for survival. In this way oxygenation is restored faster, which is the main factor enhancing the survival of grafts. At the same time, small sites reduce bleeding and loss of grafts.[2,3]



100 grafts (70 two-hair and 30 one-hair FUs) are placed in a 1cm² area.

156 hairs grew in a 1cm² area.

Recipient sites ranging from 0.8mm to 1.25mm have long been considered ideal for grafts containing 1-4 hairs. Accurate preparation under stereoscopic microscopes makes it possible to achieve intact FUs, which are coated with fine layers of dermis, but don't contain extra tissue and epidermis. Such FUs have high survival capability and are easy to implant in recipient sites of < 1.5 mm.[2,8]

Although graft insertion in closely located small recipient sites is difficult for many assistants, especially at the beginning, we have come to the conclusion that this is not a technological problem but purely an issue of training. Our experienced assistants can fill 10-12 recipient sites of ≤1mm per minute. Moreover, they would prefer to work on small recipient sites because they cause less bleeding and graft popping.

The only other risk for the survival of grafts is violation of blood circulation in the recipient zone due

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Hair Transplant Forum International
Volume 19, Number 1

Hair Transplant Forum International is published bi-monthly by the International Society of Hair Restoration Surgery, 303 West State Street, Geneva, IL 60134. First class postage paid at Chicago, IL and additional mailing offices. POSTMASTER: Send address changes to *Hair Transplant Forum International,* International Society of Hair Restoration Surgery, 303 West State Street, Geneva, IL 60134. Telephone: 630-262-5399, U.S. Domestic Toll Free: 800-444-2737; Fax: 630-262-1520.

President's Message

William M. Parsley, MD *Louisville, Kentucky*

Recently I saw a local medical professor who has a 10-year history of lichen planopilaris (LPP), confirmed by biopsy and by its typical clinical presentation. It is one of the lymphocytic variants of primary cicatricial alopecia. It appears to have been inactive for at least a year, and possibly as long as 3 years, but has destroyed over 50 percent of his scalp hair. This loss is permanent as it is with all cicatricial alopecias. He was interested in possible hair transplantation and wanted to know how long it needs to be dormant before considering transplantation. I gave him the standard answer we give for all cicatricial alopecias as if they were all the same—2 years. He asked: "What are the chances of the transplanted hair being destroyed?" I answered: "I don't know." "What are the chances of the lichen planopilaris being reactivated?" "I don't know." "How many patients with lichen planopilaris have been treated surgically?" "I don't know." "Does it respond better to excision or grafting?" "I don't know." Professors can certainly be annoying. But these are questions that need answers—and the answers need to come from us. For this reason, a new committee has been formed to create an international database to gather statistics relevant to our field. Dr. Nina Otberg from Vancouver, who will head this committee, is one of the leading researchers in a world-renowned research clinic headed by Dr. Jerry Shapiro. Dr. Shapiro will also be on the committee along with Drs. Eric Eisenberg and Jeffrey Epstein. The initial focus will be on cicatricial alopecias. The success of this important committee will depend on cooperation and input from ISHRS members. Once organized, you will be contacted by Dr. Otberg through the *Forum* and possibly by email as to the method of submitting information. In the meantime, please start gathering any cases of cicatricial alopecia that you have surgically treated so that she and her committee can get a strong start. We desperately need to begin gathering statistics.

I occasionally hear a comment that there is a lack of new material at the meetings. A little history might help here. In the late 1980s and very early 1990s, Dr. Limmer's work was somewhat ignored—until his *Derm. Surg.* article in 1994. I was just reviewing the 1999 San Francisco program. A 7-minute Friday lecture was given by Dr. Simon Rosenbaum from Australia. The talk was on removing a small triangle of tissue from the upper edge of the donor wound in order to get hairs to grow through the scar, thus making the scar less visible. Later that morning, Dr. Jerry Wong gave a talk on the lateral slit grafting technique. Both talks received very little attention. Years later they became the marquee talks at the annual meetings. They were the quiet beginnings of the trichophytic closure (Drs. Marzola, Frechet, and Rose) and also lateral (coronal) grafting. Usually the origins of significant improvements begin with no fanfare, as a poster presentation or small talk mixed in with a series of other small talks. There aren't many sure things, but there is one thing I will guarantee: There will be a little noticed presentation in Amsterdam that years down the road will be a headliner. It will seem to have exploded into the spotlight, but history will prove otherwise.

Our meeting in Amsterdam is coming up in July. I have had communications with Dr. Ken Washenik, the Program Chair, and he has a lot of creative educational ideas. The Program Committee has been studying all of the abstracts. There will be plenty of marquee talks, but also some short talks with no spotlights. It promises to be one of our best meetings ever.

Bill Parsley, MD

Co-editors' Messages

Paco Jimenez, MD *Las Palmas, Spain*

This issue comes full of interesting ideas and controversy. Let's start with the ideas. Since placing grafts is a task that requires a long learning curve, and is the major obstacle that the hair transplant procedure faces in terms of speed, we asked Dr. Jennifer Martinick to write an article outlining her experiences and recommending some practical training methods, as well as explaining how her "training placer board" has changed her practice. I personally think there is a great need for this and other kinds of training devices, which can help overcome the frustrations that all of us experience when we lose experienced technicians and have to start training new ones.

Dr. Tony Ruston shows us how simple 3D animations and graphics can help potential patients grasp basic concepts, such as the meaning of high/low hair density or the balance between donor and recipient area, and establish realistic expectations for them.

Now the controversies: How many grafts can be placed in 1cm^2 without affecting their survivability? Dr. Akaki Tsilosani shows that 100 follicular units can be transplanted into 1cm^2 with a survival rate greater than 90%. These results may appear contradictory to earlier studies, but Dr. Tsilosani emphasizes that the use of very small sites ("tight fit"), and the use of the sharpest and thinnest blades to create sites with minimal trauma are key to achieving this high level of density.

Another topic surrounded by controversy is that of follicular unit extraction (FUE). Six years after Dr. Rassman, et al., published the first peer-reviewed article on FUE, we have seen very little scientific data published in comparison with the vast quantities of publicity that this technique receives in Internet forums. In this issue we publish three articles on FUE, with very different results, that add more controversy to this topic. Dr. Bertram Ng, et al., analyze experiences and indications with FUE in the Chinese population, emphasizing that "there is no reason to promote FUE when patients have to pay a higher cost for fewer grafts and suffer the longer hours of surgery." Dr. Civas Ekrem, et al., evaluate the transection rate of three different instruments used in FUE. Finally, Dr. John Cole presents data on transection rate and hair growth achieved with his own follicular extraction procedure that he calls CIT (Cole Isolation Technique). Dr. Cole claims to achieve a transection rate of less than 3%, and an extraction speed rate of 500-1,300 per hour, which is certainly remarkable. In addition, Dr. Cole discusses the excellent results he has achieved among Asian populations. Why is there such diversity of experiences and results in the hands of different doctors? The debate is open, and we invite all our readers to send their opinions to the *Letters to the Editor* section.

Finally, we are honoured to have Dr. Rodney Sinclair, a world expert in hair disorders, answering questions in Dr. Nilofer Farjo's Hair Science column about female pattern hair loss. Practical recommendations are given about minoxidil, antiandrogens, and other therapies that will be useful in our everyday practice.

Paco Jimenez, MD

Bernard Nusbaum, MD *Coral Gables, Florida*

As we monitor the effect of the global economic crisis on the most basic financial institutions such as banks and stock exchanges, our concern also focuses on our own finances as well as the business aspect of our medical practices. We have always a felt fortunate that hair restoration surgery is a cosmetic procedure and therefore reimbursed directly by the patient. News items have recently appeared in newspapers and the Internet regarding the effect of the economy on the cosmetic surgery industry. They report a decrease in the number of cosmetic surgeries performed, as potential patients react to the drop in value of their financial portfolios. In a survey performed by the American Society of Aesthetic Plastic Surgery, 700 doctors replied, with 53% reporting a decrease in business, some by as much as 30%. Comments from the Society reveal that, in fact, business has dropped off 40% or more for many of their physicians. Patients seem to be opting for cheaper, less invasive options such as Botox and fillers to improve their appearance, if only temporarily, with the hope that better economic times will allow them to afford a more permanent, surgical solution. Another consequence of the economic crunch has been lowering of prices, with the cost of breast augmentation dropping by as much as 15-20% in some U.S. cities. Physicians have also turned to lending institutions that finance cosmetic surgical procedures, although this option may be limited as credit tightens, making it more difficult for patients to qualify. While there has been considerable news regarding the effect of the economy on other cosmetic procedures, little or none has been reported with respect to its impact on hair transplantation. There are anecdotal reports of business dropping off for many of our colleagues and some practices seem willing to offer procedures at decreased graft prices in order to maintain bookings. It is possible that patients may defer surgery and opt for medical therapy. This concept has been exploited by a laser therapy company who, in a news item (which obviously was a marketing piece promoting laser as a cheaper alternative), characterized hair transplants as expensive and invasive, and even used a reference to "doll's hair" results. Obviously, as economic conditions decline, we can expect to see more aggressive competitive practices.

On a more positive note, the psychological effect of the progression of male pattern baldness may encourage patients to come to us sooner, rather than later. As the economy falters and unemployment increases, job competition will become more intense and individuals may turn to cosmetic procedures to reverse the appearance of aging, and enhance their value in a more competitive job-seeking environment. It is known that patients will save on purchasing other things, such as cars, so that they can afford procedures to improve their appearance and self-esteem. Perhaps the economic situation will not will detract patients but will only delay them from seeking our services. Finally, we must remember that hair restoration surgery does not just restore hair, but improves self-perception and self-image, a psychosocial factor that may maintain the demand for hair transplantation and other cosmetic procedures even in harsh economic times.

Bernard Nusbaum, MD

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Submission deadlines:
February 5, March/April 2009
April 5, May/June 2009
June 5, July/August 2009

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INTERNATIONAL SOCIETY OF HAIR RESTORATION SURGERY

Notes from the Editor Emeritus

Dow B. Stough, MD *Hot Springs, Arkansas*

Von Willebrand Disease and hair restoration surgery: keep the antennae up

"Are you sure you haven't been taking any aspirin?"

"No, doc, none at all. Why, is there a problem?"

"No problem, just a little bleeding." The persistent oozing after closure of the donor area was of little concern, but the ongoing complaints from the technicians over the vascularity in the recipient area could not be ignored. *"Do you ever encounter problems at the dentist?"*

"No, doc, none at all. It does take me a long time to stop bleeding. I had a bad nose bleed last month."

"Does anyone in your family have a bleeding problem?"

"No, doc, none at all. My sister sees a hematologist for something and she always has to get a shot before surgery."

The anxiety meter rises a bit when the technicians announce the "super juice" epinephrine mixture "isn't working very well." Oh, well, 100 grafts successfully planted…only 2,900 to go!

First reported by Erik von Willebrand in 1926, von Willebrand Disease (vWD) is caused by a deficiency or abnormality of von Willebrand factor—a glue-like blood protein necessary for normal clotting. The Finnish physician studied abnormal bleeding patterns in a Scandinavian family, recognizing autosomal inheritance patterns and the increased threat to women. His index patient bled to death while menstruating.

The 1995 Stough/Haber textbook, "Hair Replacement: Surgical and Medical," featured a chapter on vWD. Since that time, little has been mentioned in the *Forum*, at our annual scientific meetings, in poster presentations, or on online blogs concerning the risk of vWD and hair restoration surgery. A recent review of vWD was published in the American Medical News (September 1, 2008, Vol. 51, No. 33). Excerpted portions of this article are used in this Editor Emeritus article.[1] The article refreshed my memory that most hair transplant surgeons may encounter cases of vWD at some point in their careers.

Prevalence

It is estimated that 2.6 million people—as many as 1 in 100—are affected by vWD, the most common inherited bleeding disorder. Awareness in general medicine remains low, and suffice it to say, those of us in hair transplant surgery probably seldom think of vWD when encountering a case of heavy or prolonged bleeding in the donor and recipient sites. Most patients go undiagnosed except in a crisis situation, such as dental work, childbirth, trauma, or prolonged bleeding after cosmetic surgery.

According to experts, however, clinical evaluation of bleeding symptoms is a challenge. For starters, some symptoms are relatively common in healthy populations making detection of vWD in its mildest form tricky. The use of aspirin or other nonsteroidal anti-inflammatory drugs exacerbates bleeding tendency, making it difficult to decipher vWD from other variables. To further complicate the issue, vWD, in rare cases, can be acquired as the result of other conditions such as hypothyroidism and certain medications, especially among elderly patients. There is no simple, single laboratory test to screen for the presence of vWD.

Lab work that is sent significant distances is often compromised because of changes in temperature and humidity. There's a 50% to 80% chance that results will come back false. Table 1 lists the initial and confirmatory tests for vWD. As hair transplant surgeons, we refer to other specialties to confirm the diagnosis. But the discovery of new cases may very well surface through a difficult hair restoration surgery case with prolonged bleeding. Such awareness seems to be more critical with sessions that routinely exceed 2,000 follicular units. My advice is that we raise the antennae of awareness and perhaps lower future problems associated with vWD.

Table 1. Making the Diagnosis

INITIAL TESTS	
vWF: Ag	An immunoassay that measures the concentration of von Willebrand protein in plasma.
vWF: RCo	A functional assay of von Willebrand factor that measures its ability to interact with normal platelets.
FVIII	A coagulant assay that measures the cofactor function of the clotting factor.
ADDITIONAL TESTS	
von Willebrand Factor Multimers	This test is used if one or more of the first three are abnormal. It illustrates the makeup or structure of the von Willebrand factor and helps determine the disease's type, i.e., 1, 2 or 3, with type 3 being the most severe.
Platelet Binding	This assay measures how well platelets are binding.

More information on testing is available online at www.nhlbi.nih.gov/guidelines/vwd/3_diagnosisandevaluation.htm

References

1. Portions of this article were extracted from the American Medical News, Health & Science section. 2008; 51(33):23-24.

Suggested Reading

1. "The Diagnosis, Evaluation and Management of Von Willebrand Disease—2008 Clinical Practice Guidelines," The National Heart, Lung and Blood Institute.✧

Survival rate

from front page

to excessive density. This is not only caused by closely located recipient sites, but it also depends on the instruments used. For minimizing the incidence of compromised blood circulation, the recipient sites should be superficial (up to 4mm),[1] and should not be larger than 1.2mm. When creating recipient sites it also is important that two sites are not merged. In addition, the recipient sites should be created with maximally sharp instruments.

Figure 1. 45 two-hair grafts are placed in a 1cm² area.

Figure 2. A density of 89 hairs in 1cm² was achieved.

For the creation of small (< 1mm) recipient sites, hair transplant surgeons generally use 19G, 20G, 21G, and 22G needles or 0.7-1mm pre-cut chisel-tip razor blades. In our opinion, these instruments cause trauma to the skin as the needles and blades become dull after creating 100-150 recipient sites. That is why we use the higher quality Sharpoint® microblades (www.surgicalspecialties.com), which remain sharp even after creating 1,000 recipient sites.

In the past few years we have analyzed *in vivo* the survival rate of FU grafts as a function of dense packing. The first series of observations were held on two volunteers in 2003.[9] Two-hair FU grafts were transplanted in 1cm² of bald scalp. For the creation of recipient sites, Nokor needles were used. Our research showed that tripling the density from 15 (in control sections) to 45 FUs per cm² did not reduce survival and achieved a survival rate of 99% and 107%, respectively (Figures 1 and 2).

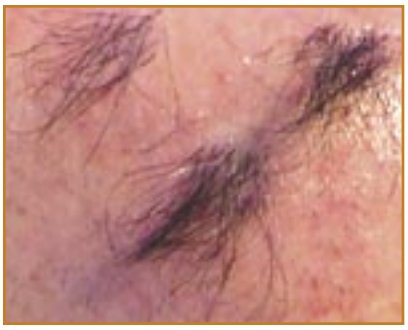

Figure 3. Seven months after transplantation: 21, 45, and 64 two-hair grafts.

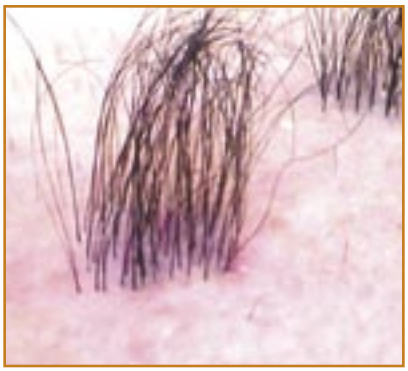

Figure 4. A density of 123 hairs in 1cm² was achieved.

We repeated the research after one year in 3 boxes of 1cm², inserting 21, 45, and 64 two-hair grafts.[10] Recipient sites this time were created with sharper 15° Sharpoint microblades. After 7 months, 123 out of 128 follicles (64 grafts) grew (Figures 3 and 4), with a survival rate of 96.1%. Based on these results we assumed that compression should not be considered as a factor of poor growth.[10] Similar results have been reported by Nakatsui, et al. who showed the growth of 126 out of 130 implanted follicles in coronal recipient sites in 1cm² (survival rate 96.92%).[5]

In 2005-2006 we started using recipient sites of < 1mm for the implantation of FUs. They were created with the 0.74 mm Sharpoint knife (ref. 78-6810) for one-hair FUs, and the 1 mm Sharpoint stab knife (ref. 72-1001) for two- and three-hair FUs (Figure 5). Thus, we were able to further increase the density of recipient sites in 1cm² and create the basis for further research with the purpose of determining the survival of FUs in a density of 100 FUs per 1cm².

Figure 5. NoKor needle, 15° Sharpoint microblade, 1mm Sharpoint microBlade, and 0.74 Sharpoint microblade.

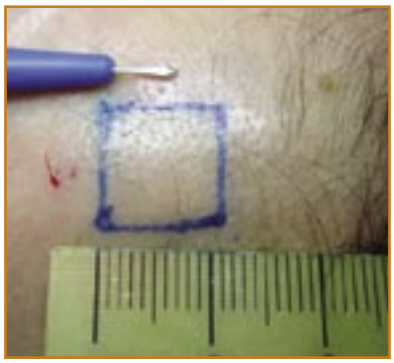

Figure 6. Template for 1cm² and 1mm Sharpoint microblade.

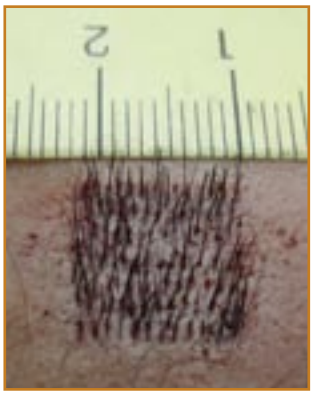

Figure 7. 100 grafts (70 two-hair and 30 one-hair FUs) are placed in a 1cm² area.

Materials and Methods

In 2007 we selected two volunteers for this research. The first volunteer was a 35-year-old, healthy, male smoker with a Norwood IV pattern. We marked a template of 1cm² in the frontal area (Figure 6). One hundred sagittal recipient sites were created in a "chess board" array with 1mm Sharpoint microblades (8 rows with 12-13 slits in each). The depth of the recipient sites strictly corresponded to the length of grafts, which were created by

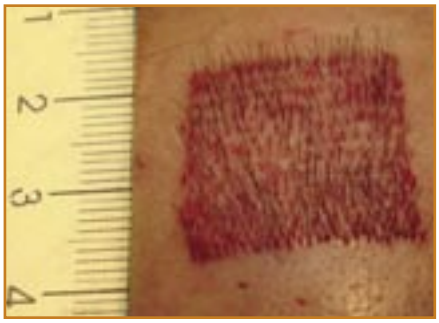

Figure 8. 400 grafts (200 two-hair and 200 one-hair FU)s are placed in a 4cm² area.

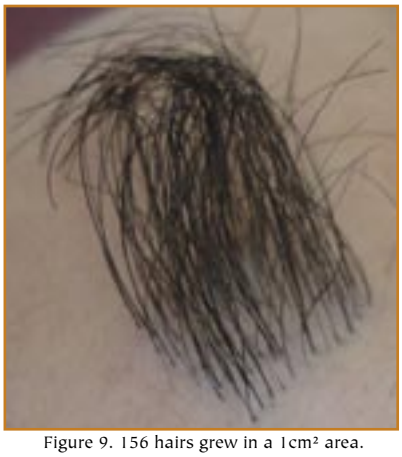

Figure 9. 156 hairs grew in a 1cm² area.

Figure 10. After 7 months, 574 hairs grew in a 4cm² area.

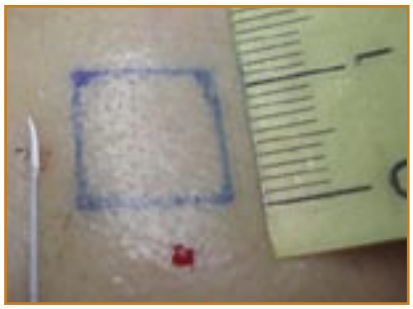

Figure 11. Template for 1cm² and 0.74mm Sharpoint mocroblade.

Figure 12. 116 grafts (46 two-hair and 70 one-hair FUs) are placed in a 1cm² area.

cutting a small donor strip under the stereomicroscope. One hundred FUs were inserted (70 two-hair and 30 one-hair grafts; 170 hair follicles in total) (Figure 7).

The second volunteer was a 48-year-old, healthy, male smoker with a Norwood IV pattern. We marked a square template in the vertex area measuring 4cm² (2cm × 2cm). We created 400 sagittal slits (16 rows with 22-27 slits in each row), and 400 grafts were implanted in these recipient sites (200 two-hair and 200 one-hair grafts; 600 hair follicles in total) (Figure 8).

Results and Discussion

After 7 months we counted the transplanted hairs. Neither the assistants nor the patients knew how many grafts were implanted. In the first case, 156 out of 170 implanted hair follicles grew (survival rate of 92%) (Figure 9); in the second case, 574 out of 600 implanted hair follicles grew (survival rate of 96%) (Figure 10).

Thus, for the first time we managed to insert 100 FUs in 1cm² without decreasing the survival rate, which in both cases exceeded 90%. Furthermore, the observation in the second case showed that the survival rate of 96% was achieved not in the isolated section of 1cm² but in an area of 4cm² in the vertex. This was achieved in spite of the unfavorable factor that both patients were smokers. Our research ended with positive results and we got over the barrier of 100 FUs per 1cm².

Two questions always arise when conducting this kind of study:

1. Would a further increase in density of transplanted follicles (more than 100 FUs per 1cm²) decrease the survival rate?
2. Would the survival of the grafts be harmed if we transplanted them not in isolated small areas of 1 or 4cm² but in a bigger recipient area (50 or 100cm²)?

In order to answer the first question, we have implanted 116 grafts (46 two-hair and 70 one-hair; total 162 follicles) into 1cm² of the scalp using Sharpoint blades of 0.74mm (Figures 11 and 12), but we are still waiting for the results at 6-8 months.

Regarding the second question, our research clearly demonstrates that it is possible to achieve a 100 FU density in small recipient areas (of a few square centimeters) in one surgery. However, we cannot demonstrate that the survival rate of grafts would be as high if transplanted into a bigger recipient area. In our practice the recipient areas are usually 60-200cm². Placing grafts at a 100 FU density in such a big recipient area would require an enormous number (6,000-20,000), which is simply impossible to obtain. In our everyday practice, we implant grafts with a density of 25-40/cm² and seldom 50-70/cm². Thus, the main factor limiting the results of our operations is not the density of packing grafts but obtaining them in the required quantity.

References

1. Arnold, J. Mini-blades and a mini-blade handle for hair transplantation. *Am J Cosm Surgery.* 1997; 14(2):195-200.
2. Bernstein, R.M., and W.R. Rassman. The logic of follicular unit transplantation. *Dermatologic Clinics.* 1999; 17(2):1-35.
3. Bernstein, R.M., et al. The future in hair transplantation. *Journal of Aesthetic Dermatology and Cosmetic Dermatologic Surgery.* 1999; 1(1):55-89.
4. Mayer, M.L., D. Perez-Mesa, and M. Barusco. Graft density yield curve. Presented at the 9th Annual Meeting of International Society of Hair Restoration Surgery. Mexico, October 18-22, 2001.
5. Nakatsui, Th., J. Wong, and D. Croot. Survival of density packed follicular unit grafts using the lateral slit technique. *Dermatologic Surgery.* 2008; (8):1016-1022.
6. Seager, D.J. Micrograft size and subsequent survival. *Dermatologic Surgery.* 1997; 23:772-774.
7. Seager, D.J. The "one-pass hair transplant"—a six-year perspective. *Hair Transplant Forum Int.* 2002; 12(5):1-6.
8. Seager, D.J. The three most important ways to achieve density. Presented at the 11th Annual Scientific Meeting of the International Society of Hair Restoration Surgery. New York, October 2003.
9. Tsilosani, A., M. Gugava, and T. Tamazashvili. Graft density and survival. *Georgian Medical News.* 2004; 11(116):29-32.
10. Tsilosani, A., and M. Gugava. Can the compression still be considered as a primary cause of decreased graft survival? *Annals of Surgery.* 2005; (5):67-70.✧