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President's Message

Vincenzo Gambino, MD, FISHRS *Milan, Italy*
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In San Francisco at the beginning of my term as president, my wife said to me, "I hope you have any easy year." Reflecting back, now nearing the end, I can honestly say it has been very challenging.

The political uncertainty in Bangkok compelled us to relocate the 2014 meeting. Committed to holding this meeting in Asia, Kuala Lumpur was chosen. Moving a meeting of this size on such short notice and avoiding catastrophic financial consequences was an incredible accomplishment.

It's ironic and sad that as I sat here writing this, the news reported that a Malaysian jetliner was shot down over Ukraine, the second time in recent months that Malaysian Airlines lost a plane. In the wake of this disaster, I started receiving emails from members with concerns about the safety of Kuala Lumpur and questioning why the commitment to hold the meeting in Asia. I hope my personal letters explaining that these tragedies did not impact Kuala Lumpur as a safe location and that Asia represents a large and growing percentage of our membership assuaged their concerns and they will join us at the meeting. To those of you with concerns who did not write, please know that there has never been one moment when the safety of our members was not foremost in our minds, and we would not hesitate to cancel a meeting if we felt there was peril.

I am sure you all know that the big issue we've prioritized is stopping the unlicensed practice of medicine in hair restoration. Up to now, this has mainly been seen as an American problem but, as predicted, it is spreading globally. In Italy, where only doctors are allowed to give anesthesia and make incisions, there are now groups of freelance techs/nurses advertising their services—officially to assist but in reality saying they do the entire procedure.

Without a doubt, the most alarming situation is in Korea where the vast proliferation of hair restoration clinics greatly exceeds the number of trained hair restoration surgeons. In the past, techs there were caught on video, prosecuted, and jailed for performing surgery illegally. Today, unscrupulous clinics give patients sleep-inducing anesthesia and lock the door to the surgery room so the patient has no idea who is performing the surgery.

The Korean Society is actively going after these illegal operations and alerting patients to take a family member or guardian into the surgery room so that they can monitor who performs the procedure. The ISHRS Board of Governors is committed to aggressively protecting patients from those who prey on them for profit.

In my first message I asked you to write me, and I am grateful to those of you who took the time to share your ideas and concerns. Those letters helped me focus on your priorities.

I want to give my sincerest gratitude to this year's meeting Program Chair, Dr. Damkerng Pathomvanich, who under the most difficult circumstance of a meeting being relocated from his native country, regrouped and put together a brilliant program.

Many of you may not know how much Victoria Ceh, the ISHRS Executive Director, and her team do to run the mechanics of our Society, implementing the Board of Governors directives and planning and organizing the non-scientific part of our annual meeting. Multi-tasking with great diplomacy, she keeps us running smoothly, and I want to take this opportunity to give my thanks and appreciation for her hard work.

I've been privileged to serve with a team of colleagues who generously gave of their time, wisdom, and experience. I thank my predecessor, Dr. Carlos Puig, for laying the foundation on which this year was built, and I know we will be in good hands when Dr. Sharon Keene takes over the presidency after Kuala Lumpur.

Most of all, I want to thank you, the membership, for allowing me to serve in a position of such responsibility. It has been an honour and a privilege.

Grazie,
Vincenzo ♦

Co-editors' Messages

Mario Marzola, MBBS Adelaide, South Australia editors@ISHRS.org

By the time this issue of the *Forum* reaches you, we may already be at our 22nd Annual Scientific Meeting in Kuala Lumpur. It's exciting to see so many registrants already from Asia and surrounds. This is exactly what we had hoped for. Kudos to ISHRS leadership for taking this meeting "East." So many of us have said that this part of the world is hungry for information on hair restoration, and we in the ISHRS have a store of information to share. Annual Meeting Program Chair Dr. Damkerng Pathomvanich and his committee have put together an outstanding program of didactic lectures, demonstrations, and workshops. The meeting is designed to benefit all registrants from beginners to the most experienced. Every year we say this has been the best meeting so far. It looks like we will be saying it again this year.

This is the biggest and best meeting of the year, so we hope to see you there.

In keeping with the Asian flavor, we feature in this edition a discussion with Dr. Jerry Wong, president of the Asian Association of Hair Restoration Surgeons (AAHRS) with comments from Dr. Damkerng Pathomvanich. The format is a little different from previous editions as this umbrella association covers many countries including those that are too small or too inexperienced in hair restoration to have their own society. I hope

you enjoy reading about the journey that hair restoration is undertaking right now in Asia; the dynamic energy and excitement is palpable.

Part of the dynamism in our field also belongs to the restless and lateral thinking minds that abound in our specialty, like that of Dr. John Cole. One would have thought that harvesting follicular unit grafts with minimal surgery and minimal transection rates would be enough. However, responding as we do to patient feedback about the difficulty of camouflaging the shaved area post-operatively, why not develop non-shaven FUE? NSFUE, as Dr. Cole calls it, is detailed in our lead article. My co-editor Dr. True and I believe that this is very likely the future preferred technique of harvesting grafts. And why not? Dr. Cole has developed the technique with his associates to the point where total numbers of grafts, time taken to harvest them, and transection rates are the same as shaved FUE. How much less intrusive can we be in the donor area?

This, our fifth edition together, is jam-packed with news and views, old and new ideas, all designed to produce better outcomes for our patients. We hope you enjoy it. ♦



Robert H. True, MD, MPH, FISHRS New York, New York, USA editors@ISHRS.org

In this issue, Editor Emeritus Dr. Russell Knudsen expresses his concerns over trends in donor area management in FUE. I think he makes a number of valuable points and I know his respected views are held by others. However, I want to offer some counterpoints. His assertion that "FUE turned out to be basically a re-imagining of traditional punch grafting but with tiny punches" ignores the fundamental difference between the two techniques, in that punch graft harvesting is full-depth excision whereas FUE is limited depth extraction.

Experienced practitioners of FUE are well aware of the concepts of the "safer" donor zone. This area is their primary target and will constitute at least 90% of the harvested follicles. I don't think it makes sense to then project that the follicles harvested from this area via FUE will be any less permanent than with FUT. It is only the follicles harvested outside of this zone that may be "temporary," but they represent a relatively small percentage of the grafts, and if they are mixed in among grafts from the "safer zone," their gradual attrition over time is likely to result in a subtle decrease in transplanted density rather than some imagined regression to baldness.

The ISHRS's FUE Research Committee has a Subcommittee on Terminology. In this FUE terminology group, we took great effort to be precise in our suggestion of standard terminology. Dr. Knudsen refers to the practice of "deliberate vertical transection of the follicular unit" during FUE. In our standardized FUE terminology, we refer to this as "splitting," not transection: "Splitting is the action of separating with the punch *in vivo* (or *in situ*) a portion of the follicles from a group (follicular family or follicular unit)." The extracted graft will

contain fewer follicles than are in the group. Splitting can be produced deliberately or unintentionally. Transection, on the other hand, is defined as the following: "Any microscopically visible breakage of a follicle anywhere along its entire length."

As Dr. John Cole argued so persuasively in last issue's *Cyberspace Chat* (Vol. 24, No. 4; pp. 138-140), follicular units can only be correctly identified within the dermis. What we see as a follicular unit on the surface of the skin, upon closer inspection, may contain two or more follicular units. With high-powered loupes, a trained eye can differentiate the follicles within a group as emerging together or slightly separated. Then a fraction of a follicular group can be split harvested from the donor area while the other portion of the follicular group remains in the donor area. These remaining portions may contain some transected follicles, but most are intact follicles.

I believe it is a general consensus among experienced FUE practitioners that a properly performed FUE session will average around 2.3-2.4 or more hairs per graft, which is equal to or better than the average hairs per graft with FUT. Therefore, I do not think Dr. Knudsen is right in saying that FUE offers only two-thirds of the hair offered with FUT.

Thanks again to all who have contributed to this issue of the *Forum*. I am looking forward to our gathering in Kuala Lumpur. ♦



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- Articles should be written with the intent of sharing scientific information with the purpose of progressing the art and science of hair restoration and benefiting patient outcomes.
- If results are presented, the medical regimen or surgical techniques that were used to obtain the results should be disclosed in detail.
- Articles submitted with the sole purpose of promotion or marketing will not be accepted.
- Authors should acknowledge all funding sources that supported their work as well as any relevant corporate affiliation.
- Trademarked names should not be used to refer to devices or techniques, when possible.
- Although we encourage submission of articles that may only contain the author's opinion for the purpose of stimulating thought, the editors may present such articles to colleagues who are experts in the particular area in question, for the purpose of obtaining rebuttal opinions to be published alongside the original article. Occasionally, a manuscript might be sent to an external reviewer, who will judge the manuscript in a blinded fashion to make recommendations about its acceptance, further revision, or rejection.
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- All photos and figures referred to in your article should be sent as separate attachments in JPEG or TIFF format. Be sure to attach your files to the email. Do NOT embed your files in the email or in the document itself (other than to show placement within the article).
- We CANNOT accept photos taken on cell phones.
- Please include a contact email address to be published with your article.

Submission deadlines:

October 5 for November/December 2014 issue
 December 5 for January/February 2015 issue



Notes from the Editor Emeritus

Russell G. Knudsen, MBBS, FISHRS Sydney, Australia drknudsen@hair-surgeon.com



The Temporary Two-Thirds Transplant?

Occasionally, in our field, there are big paradigm shifts that significantly alter the way we treat our patients. The biggest paradigm shift was arguably initiated by Dr. Bobby Limmer with his development of follicular unit transplantation (FUT), which basically replaced any other size of grafts in most practices around the world.

However, it is interesting to analyze why paradigm shifts occur. In some cases, it is clearly a response to problems associated with a certain style of treatment. In other cases, it results from innovation producing better outcomes. Sometimes, it appears to be a response to changing patient expectations. Or, it might be a combination of any, or all, of these factors. The development of FUT arguably was a response to all the above factors.

FUT taught us that the intact follicular unit was "sacred," to be preserved and successfully transported from the donor area to the recipient area. Inherent in this was the understanding that the primary focus was the recipient area with a natural result to be achieved in this area. The donor area esthetics were slightly less important.

A more recent big paradigm shift seems to be a reversal of emphasis that now arguably elevates the donor area to the same, if not greater, importance as the recipient area.

Firstly, partially in response to patient expectations, we moved to trichophytic donor closures, which acknowledged that the appearance of the donor area scar was important, particularly in males who wished to wear a shorter hairstyle. This had positive implications for the donor area and no implications for the recipient area.

Secondly, follicular unit extraction (FUE) was developed (initially in Australia) as a response to poor donor scar outcomes. FUE turned out to be basically a re-imagining of traditional punch grafting but with tiny punches. This paradigm shift has slowly gained increasing popularity and shows no sign of slowing down. The "selling point" is an equivalent result to FUT without the linear scar. Again, positive implications for the donor area with no implications for the recipient area.

I have written before of my reservations about large FUE sessions in young, extensively balding men, as I fear that baldness progression will encroach into previously harvested donor areas. This comes about via two mechanisms: firstly, the requirement to utilize 4-5 times the size of donor area for an equivalent number of grafts and secondly, the requirement to create an "even thinning" of the donor area so as to avoid creating zones of significantly higher density. This includes areas immediately nearby the balding margins.

Recently, I have heard promoted (by experienced and highly reputable surgeons) the idea that this need not be regarded as a problem because "they had the hair when they needed it most" (as younger men). So we have a potential paradigm shift that dramatically rearranges the planning principles. We no longer need to claim long-term results, just results that last 5-10 years when you need them most.

Another espoused FUE paradigm shift suggests that deliberate vertical transection of the follicular unit in the donor area during harvesting is beneficial because the remaining hair(s) in the in-situ follicular unit ensure there are no "gaps" in the donor area coverage! An example would be deliberate cleavage of a 3-hair FU so that 1 hair remained in the donor and 2 hairs were transplanted to the recipient area.

If we combine these two new paradigm shifts together, the logical result of attempting to find the perfect operation for those men, with any degree of balding, that wish to wear their hair very short, we come to the ultimate expression of the mantra that the donor area appearance is now sacred: the Temporary Two-Thirds Transplant. Yes, it is only two-thirds the density of strip transplants utilizing intact follicular unit grafts and yes, it may have been harvested from a future balding area, but both the donor and recipient areas look equally good!

As this outcome has "positive" implications for the donor area but negative implications for the recipient area, I sincerely hope this is not where the field is headed. ♦

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FUE Non-Shaven Technique *from front page*

I thought of using a sharp punch to cut the hair follicles of individual clusters. With this tool, you can either cut the hair and the graft in one step, or you can cut the hair first and then cut the graft in two steps with the same punch. As a third alternative, you could use a punch to first cut the hairs in the groups and then later return to cut the grafts.

An advantage of using a sharp punch is minimization of skin and follicle distortion. However, when the punch is used to cut hair, it is dulled and the most important advantage of the sharp punch is lost. Only fine hair is easily cut with a sharp punch; coarse hair requires more axial force to cut the hair, which quickly dulls the punch.

Furthermore, it is difficult to see the angle of hair emergence with the hair long. The stiff nature of the hair follicle cluster can cause the punch to slide slightly to one side so the cut is off center rather than at the center of the circle, or “bull’s-eye.”¹ In 2005, we tried using a mechanical punch to cut the hair and the graft simultaneously but this provided less than optimal results. More recently, Dr. Park called this technique the *direct non-shaven FUE technique*. Inevitably, a consequence of using the punch to cut the hair and the graft is a higher transection rate and grafts that are not optimal. Dr. Park noted that his average follicle transection rate more than doubled using this direct non-shaven FUE technique.

The only remaining advantage of the direct non-shaven technique is the elimination of a step in the donor area preparation phase. With the aforementioned issues, this alone is not sufficient to justify using the punch to simultaneously cut the hair and the graft.

Finally, I resorted to using scissors to trim the individual clusters of hair and the punch to cut grafts. This proved to be the most time consuming but most precise way to obtain an even distribution of prepared clusters and optimal grafts. There was less follicle transection regardless of whether the punch to cut grafts was dull or sharp, because the angle of hair emergence was easy to see. And since the hair is already cut, the punch will not slide off center.

Eventually, I created a protocol that currently allows me to trim enough clusters to obtain over 3,000 grafts in a single sitting without shaving the head. Along the way, I modified the scissors to more easily accomplish this task (Figure 4). The donor area can be prepared for surgery in under one hour with a team approach. My team approach involves three assistants trimming the donor area simultaneously.

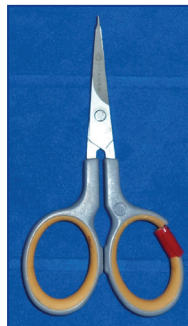


Figure 4. Modified scissors for trimming individual follicular groups has a narrow tip. The distal point of the scissors is blunted to avoid puncturing the skin of the patient.

The Cole Isolation Technique

I begin by dividing the donor area into 14 distinct regions over the 203cm² safe donor area (SDA).² A donor template facilitates this design process. These regions include 8 larger major regions and 6 smaller minor regions (Figure 5). The minor regions lie in the more inferior surface area within the SDA. In general, I avoid these inferior regions in initial surgeries unless I am planning a very large procedure requiring grafts from this area. I avoid them because the hair is finer and there are more telogen hairs in this region. The significance of a higher telogen ratio is unknown, but hair loss in nape of the neck, *retrograde alopecia*, is quite common. A higher telogen ratio may be indicative of a higher probability of future thinning in the inferior region of the donor area. Furthermore, the extraction sites toward the nape of the neck are more commonly visible when patients elect a very short “fade” hairstyle.

Once the donor area is divided into 14 regions, trimming hair clusters begins (Figure 6). My team of three works simultaneously, one region at a time, with an inferior to superior progression while the patient is seated. One assistant sits in the occipital area, while the other two sit on the contralateral parietal-temporal aspects of the patient.

Dividing the donor area into 14 regions allows me to determine how many clusters need to be trimmed in each region. If the case is small, they trim randomly throughout the major regions. If a maximal harvest is needed, they will trim every other cluster or at least 25% of the clusters within a region. The average number of follicular groups in each of the 8 major regions is 1,542; therefore, maximal trimming (25%) would consist of 386 follicular groups. In each of the 6 minor regions there is an average of 495 follicular groups. Maximal trimming consists of at least 124 follicular groups. Generally, my staff exceeds these minimums simply to ensure the target goal is met. Dr. Bang also trims slightly more than he plans to extract to ensure his graft target is reached.

For example, if 1,000 grafts are to be harvested from the 8 major regions, at least 125 clusters should be trimmed within each region. It is not uncommon to increase the number of trimmed clusters as much as 75%. All trimmed clusters are not necessarily harvested. Alternatively, I might harvest more than are initially trimmed. I do my best to avoid trimming a second time, but it is easy to trim more clusters if needed. If an area is overtrimmed, the patient is given a concealer, such as Couvre, DermMatch®, or Nanogen, to use until the hairs are grown out.

When only a few additional grafts are required from a region that has already been trimmed and harvested, I often will use the punch to first trim the hair and then cut the graft. Alternatively, I might choose the direct non-shaven approach and use the punch to cut the hair and the graft simultaneously. Invariably, this process will shorten the lifespan of a sharp punch.

When trimming hair, the chief objective is to ensure the proper length of cut hair. If it is too short, it can be difficult to see the exit angle of the hair. With tumescence, the length of the hair will appear decreased as the skin expands. The tumescence will dissipate over a brief period of time but this can delay the harvesting process. Conversely, if hair length is too long, the direction of hair growth will appear different than it actually is due to the natural curve of all hair toward the skin surface. Longer trimmed hair can make passing the punch over the follicles more difficult and time consuming. Hence, it is imperative that the length of the hair be optimized.

Patients have individual donor characteristics that impact the number of follicular groups that can be trimmed successfully.

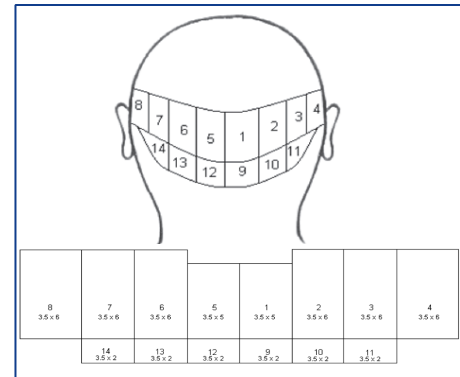


Figure 5. (top) The donor area is divided into 8 major boxes and 6 minor boxes within the safe donor area. (bottom) The boxes are numbered so that the total extractions from each box, the surface area of scarring in each box, and skin lesions in each box can be easily recorded.

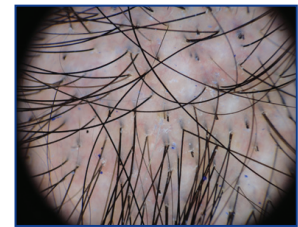


Figure 6. Some follicular units are trimmed, while others are not, within the safe donor area so that the extraction sites may be concealed immediately following surgery. (Photo courtesy of Dr. Jisung Bang.)

Trimming is limited if the patient has a lower density and fine hair or if the patient has multiple scars or wide scars. When the patient has high density, coarse hair and wavy hair, maximal donor trimming is more easily concealed.

Harvesting

When harvesting, I work in a seated position. I begin at the inferior-most point of a region and work from left to right on the right side of the patient and right to left on the left side of the patient to take greatest advantage of gravitational forces on the flow of blood. Within each region, I move in small incremental steps from inferior to superior, again to take advantage of gravity. To keep the operative field clear of blood, I use vasoconstrictive tumescence and micro-suction. The suction tip often tends to move the hair into the surgical field so care must be exercised.

As I move superiorly, I use a lightweight aluminum hair clip to hold hair out of the surgical field. The weight of the clip is an important consideration; a heavier clip tends to fall down into the operative field. I also use my punch, both manual and mechanical, to sweep stray hair out of my surgical field and improve my view prior to cutting individual follicular clusters. As I move superiorly, I relocate the hair clip several rows up. When I advance to the level of the clear field, I move the clip superiorly again to expose more trimmed follicle clusters.

It is important to note that my two most medial major regions contain only 17.5cm², while the three lateral regions to each side each contain 21cm². When planning my procedure, I often have to take a few more grafts from the lateral regions to make up for the reduced size of the medial regions. Alternatively, I can harvest a higher percentage from the medial two regions (1 and 5 in Figure 5) because follicular unit density is often higher in the medial regions. Generally, I plan to harvest at least 10% of the desired graft total from each of the 8 major regions. Then I can use the inferior minor regions to harvest the remaining 20% of my desired total. The 6 minor regions are equal in size to 2 major regions.

For example, if I want to reach a target of 2,000 grafts, I need to harvest a minimum of 200 grafts from each major region and 400 grafts from the minor regions. However, if I wish to harvest precisely 2,000 grafts from the major regions, I must remove 250 grafts from each region. The total number can also be limited from the most lateral regions (4 and 8) as long as the number from the more medial regions adjusts accordingly. The density is often lower laterally to begin with and the hair is often finer. Overharvesting these lateral areas may result in patients complaining the area is too thin following maximal harvesting, especially when you maximally harvest more than one procedure. The following table can help to help plan a procedure based on the desired graft count:

Number of Grafts Harvested from Each Major Region

TARGET	GRAFT RANGE
25	200
50	400
75	600
100	800
125	1,000
150	1,200
175	1,400
200	1,600
225	1,800
250	2,000
275	2,200

TARGET	GRAFT RANGE
300	2,400
325	2,600
350	2,800
375	3,000
400	3,200
425	3,400
450	3,600
475	3,800
500	4,000

Only dense donor areas allow more than 400 full-size follicular clusters from any major region in a single procedure. Only the most dense donor areas will yield 500 or more full-size follicular clusters.

I cut, remove, and place grafts in rapid succession to expedite the procedure and minimize the time out of body for the grafts. The seated position facilitates this process. I begin harvesting on the right side in box 3 or 4. When I am finished cutting one box, I move to the left side in box 7 or 8. As I begin harvesting in box 7 or 8, my assistant removes the grafts in the box I just cut. Generally, it takes me 3-5 minutes to cut each 100 grafts. The cutting rate is predicated by individual patient characteristics, which influence the complexities and difficulties of each case. When I finish cutting box 7 or 8, I move back to the right side to harvest another box while my assistant moves to the left side to remove those most recently circumscribed grafts.

As soon as I have the grafts out, my Registered Nurse begins local anesthesia in the recipient area that I designed prior to starting the procedure. Discomfort in the donor area is much less than in strip surgery, however, local anesthesia to the recipient area does not last as long with FUE. Once anesthesia is achieved, I make recipient sites. I move in a central to peripheral direction to avoid tachyphylaxis to the local anesthesia.

My assistant and I continue alternating side-to-side during the harvesting process, while one or two assistants place grafts in the recipient area. Once all the grafts are harvested, I add a third assistant to help place grafts if needed. My objective is to get as many hands on the patient as possible so that the procedure progresses as quickly as possible.

I use a minimal-depth approach to harvest grafts. I set punch depth typically between 2-3mm deep. I insert the punch to 2mm initially. I then insert my extraction forceps (ATOE) to the maximal depth of the incision and attempt to remove the graft by applying either external force on the graft or by pushing the donor area skin away from the graft (counter-traction) with my Castroviejo forceps (Figure 7).³ If the graft is easily plucked from the donor area, I consider extracting at a more shallow depth.

The graft is eased out rather than jerked out so that the entire outer root sheath (ORS) and connective tissue sheath remain on all the hair follicles. If one or more follicles lack a portion of the ORS or the inner root sheath (IRS), the follicle has been plucked and we must either incise deeper or use a more gentle



Figure 7. I insert the Aide to Extraction (ATOE) to the maximal depth of the incision, grasp the graft firmly with the ATOE forceps, and then ease the graft out. The maximal depth is typically between 2mm and 3mm. In this instance, the maximal depth was approximately 2.2mm.

FUE Non-Shaven Technique *from page 167*

extraction force on the graft. You can use as much compression force on the graft with the ATOE as desired without negatively impacting hair growth.

If the graft does not pluck easily from the tissue, I incise deeper. I continue adding depth to the punch until I locate an incision depth that allows easy extraction. Once I find a depth that allows easy extraction, I see if a more shallow depth will allow easy extraction. For example, if I increase the depth to 2.5mm and find that the extraction is easy, I then change the depth to 2.2mm to see if the graft is still easily plucked intact. If 2.2mm does not work, I try 2.4mm. My objective is to always find the least depth because minimal depth reduces follicle transection, especially when there is hair splay. When I must incise deeper, hair splay often necessitates an increase in my punch size due to follicle splay.

A variety of factors influence the ease or difficulty of graft removal. One way to remember these factors is by using the mnemonic "Arcades":

A. The angle of hair emergence predominately in the x and y axis. An acute slope and a larger value for x in either the negative or positive direction increase extraction difficulty.

R. A restless patient who is constantly moving will slow and complicate the extraction process.

C. The consistency of the skin influences the life of a sharp punch. A rubbery skin dulls a punch more quickly and it can increase extraction difficulty. A soft skin allows a long life to a sharp punch. A duller punch will require more axial force, require more tangential force, slow the dissection process, increase follicle displacement in response to axial force, and increase the probability of follicle transection. The way to overcome a dulling punch is to increase the tangential force, such as the RPM. I usually start with a true 1,250 RPM and increase in increments (e.g., 1,800, 2,500, 3,000, 4,000). At some point, the transection rate increases as the punch dulls. Once the transection rate begins to climb, the punch should be changed. Obviously, the other solution is to change the punch when it begins to dull.

I would like to add that, in some instances, a much higher RPM is optimal to overcome the tensile strength of the skin and to minimize transection. This is especially true in rubbery skin. When you find that the transection rate is high even with a larger punch or a smaller punch, you should consider a very high RPM. This is one reason I created the Vortex device, which allows me to achieve higher RPM up to 25,000. Sometimes, but not always, this higher RPM is the optimal solution to a case of FUE. You will also find that there is a range of RPM where the transection rate is higher with a very sharp punch. Once you exceed this range, the transection rate will decline. In addition, at a very high RPM, the skin is cut much cleaner, whereas at a lower RPM, including the very low range, the skin seems to initially tear rather than be cut so the edges are jagged and not smooth. I would not start above 2,500 RPM with a fresh sharp punch. Both rubbery skin and soft skin may be found in elastic (loose) skin and firm skin. Each characteristic is distinct and different.

A. The attachment between the adipose and the ORS and the attachment of ORS to the IRS are important. In standardized FUE terminology, this is referred to as tethering.³ A firm attachment between the ORS and the adipose requires a deeper incision. A weak attachment between the ORS and the IRS requires a deeper incision.

D. The depth of incision influences follicle transection. When I must incise closer to 3.0mm or rarely deeper, the rate of follicle transection tends to increase markedly. The goal is to keep follicle transection under 3% and graft transection under 12%.

Minimal depth reduces transection rates and also improves follicle regeneration with ACell.

E. The elasticity of the skin influences follicle movement in response to an axial force. Firm skin tolerates more axial force with less follicle displacement. Loose skin results in significant displacement of skin and follicle in response to more axial force. Skin traction can help reduce skin movement in response to an axial force.

S. Follicle splay increases the risk of follicle transection and often requires a larger punch or a more shallow incision.

For each procedure I take into consideration three types of density: hair density, follicular unit density, and calculated density. Dividing the hair density by the follicular unit density gives the calculated density.^{4,5} Those individuals who have a calculated density (as defined in the standard FUE terminology) greater than 3.0 hairs per follicular unit are excellent candidates for sub-follicular unit harvesting (SFUH). In SFUH, I remove 1-4 (most commonly 2) follicles from a follicular cluster using a smaller punch. In such donor areas, I often can obtain a much higher graft count by harvesting from adjacent follicular clusters rather than by harvesting from every other intact follicular unit. With sub-follicular unit harvesting, you have the potential to produce a better aesthetic donor area and more grafts. It is important to remember that 7,000-9,000 grafts obtained by sub-follicular unit harvesting may be the equivalent of only 5,000 full-size grafts with respect to the total number of hairs transferred.

The anatomical location influences the size of follicular units and the hair diameter. The size of follicular units (number of hairs) tends to be larger medially and superiorly in the donor area. Hair diameter tends to be finer laterally and inferiorly in the donor area. This can influence your choice of punch size. You might want a smaller punch laterally where hair is finer and the follicular units contain fewer hairs, or you might want a larger punch superiorly where there tends to be more hairs per unit and hair that is coarser.

Learning Curve

The learning curve for the non-shaven approach is more difficult than for the completely or partially shaven approaches. In the shaven approach, you are dealing with proper punch positioning, following the direction of hair growth, and contending with blood flow. In the non-shaven approach, the complexity of dealing with long hair is added. When I first began the non-shaven approach, I would end each day with eye fatigue and headache. As I practiced the approach more, I learned to focus on the individual cut follicular clusters and not allow the untrimmed hair along with blood flow to distract me.

Both Drs. Bang and Park note that the rate of harvesting is slower with the non-shaven approach. Dr. Bang found that with continued practice the speed of extraction improved and the follicle transection rate decreased with the non-shaven approach. Dr. Bang prepares the donor area and manages donor harvesting in a similar fashion to my technique. With continued practice, most physicians find the rate of extraction and the quality of the grafts improves.

Donor Area Scarring and a Pre-look

Patients who have multiple scars or wide scars in their donor area present difficult challenges. If too much donor hair is removed in subsequent procedures, you risk revealing a scar that was previously concealed. In the past, before removing a strip, I always trimmed the area first, then let the hair fall back over the area. Next, I stepped back to look at the donor area without the long hair that I trimmed. If the scar was visible, I would reduce

the width of my strip in the area of the scar. In NSFUE, you have a wonderful opportunity to evaluate the appearance of scarring before harvesting. I never intend to overtrim the donor area, but after trimming, I always let the hair down and step back behind the patient to view the scar under normal lighting situations. If the scarring is apparent, I limit my extractions.

A non-shaven approach allows patients to view their donor area prior to harvesting to ensure acceptance of the removal of grafts. On occasion, FUE patients with a lower follicular unit density or fine hair have complained about being too thin in certain regions of the donor area even after a single pass of 2,000 grafts. The pre-look with NSFUE allows the patients an opportunity to voice their concerns prior to harvesting. On one occasion, I had a female who elected to cancel surgery after trimming her donor area for NSFUE because she felt the residual long hair was too thin. In this case, it was better to discover her displeasure prior to extracting the trimmed follicles.

Once the grafts are extracted from the donor area, they are managed the same regardless of extraction technique. If the recipient area is not shaved, recipient site preparation is more challenging. However, the non-shaven recipient area is managed the same way as with a non-shaven strip harvest: I attempt to place the grafts as quickly as possible following their extraction.

Complications

Individuals who undergo NSFUE wish to conceal their recent hair transplant procedure. When the donor area is overtrimmed, the patient may feel uncomfortable with his or her immediate post-surgical appearance. Provided that the physician does not overharvest, time should eliminate this concern. Donor area concealers can reduce patient anxiety while waiting for the trimmed hair to grow. If the donor area is overharvested such that scars become visible, the physician will need to add hair to the donor area to help conceal the scarring. Hair may be grafted into the scar, as well as to the periphery of the scar, and to donor extraction sites, as well as to thin donor areas between existing follicular groups. A custom wig can be crafted using the hair trimmed when preparing the donor area for NSFUE. This wig can be glued to the scar as a temporary measure to help conceal an overtrimmed donor area. Micropigmentation to hypopigmented extraction sites and to donor scars can also be considered.

Mechanical extractors typically apply a rotating or oscillating motion to the punch. When harvesting with a mechanical extractor, hair can be unintentionally plucked or cut by the rotating punch. Depth stops that externally rotate with the punch increase the probability that hair will catch and begin to accumulate on the rotating punch. Use of a non-rotating depth stop external to the rotating punch will help reduce the probability of this complication, but it will not eliminate the risk. Also, use of intermittent rotation or oscillation will help reduce the risk of long hair torsion and cutting with the punch. If hair accumulates on the punch, the punch must be stopped and the accumulated hair removed from the surface of the punch to avoid promoting additional hair accumulation.

When grafts are harvested in a dense fashion by FUE in narrow bands of shaved patches, clusters of hypopigmented scars result. This complication is often unacceptable to patients. To remedy, scalp hair or beard hair may be grafted into the hypopigmented scars. Scalp hair should be harvested in an irregular well-spread-out fashion from the safe donor area when treating this complication. This complication can also be treated with micropigmentation. Ultimately, it is better to avoid this complication by eliminating the shaved patch from your list of procedures.

Summary

Often, patients cannot shave their heads due to work or social obligations. Thus, I believe the NSFUE approach is the future of hair transplant surgery. Patients can resume their normal lives much more rapidly and patients with scars do not have to unmask their embarrassing scars. Graft counts can routinely be obtained in excess of 3,000, and on occasion in excess of 4,000, using a non-shaven approach. With practice, follicle transection rates with NSFUE are just as low as with the shaven approach to FUE. With NSFUE, donor area preparation time is longer, but the speed of extraction is rapid. You also can evaluate the donor area appearance prior to maximal harvesting, and adjust harvesting by getting a look into the future.

This procedure is state-of-the-art FUE and the future for hair restoration surgery. A video of the non-shaven FUE technique is available at <http://gdriv.es/ns-fue>.

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Editor's note: Dr. Cole is reluctant to give an ideal hair length for FUE, as is it impossible to measure. In my experience, it is somewhere between ½ and 1mm. I have found that there are some cases in which the shaven patches work well. The patient wants to do small treatments and gradually enlarge the transplanted area, so there is a planned course of sequential harvest and the end result will be an evenly dispersed harvest and a full restoration that is gradually realized. I do this only with patients who are clearly committed to a course of treatment with sessions about every 6 months. In these instances, I intentionally decrease my usual harvest density. Dr. Cole prefers a stand-alone solution that does not presume the patient will come back for more treatment. I see his point, but still maintain that I can recognize patients who will stick with this treatment approach and achieve a goal of an even donor harvest and bald area restoration. —RT♦