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IN THIS ISSUE

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Tattoo Pigment Delivery with a Laser-Based Microjet Injector

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A Side-by-Side Study of FUT vs. FUE Graft Availability in the Same Patients and Its Implications on Lifetime Donor Supply and Management

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ABSTRACT

Introduction: One of a patient's most important goals is meeting expectations of coverage and density. Limited donor supply is a handicap in many patients with respect to achieving this goal. Choosing an approach that maximizes lifetime donor supply would be beneficial. Controversy exists over which technique, or combination of techniques, is best for maximizing donor supply. Some feel that FUE alone is sufficient, while others feel that the use of FUT in combination with FUE may be better in patients requiring greater numbers of grafts.

Objective: The goal of this study is to get a better understanding of the difference in donor supply available with FUE only, FUT only, or Combination ("combo") FUT/FUE.

Study Design: A side-by-side study was done in which two patients had FUE only harvested from one side (half) of the head, and FUT only from the other side (half). This "side by side" harvesting was done two times one year apart. The number of hair (grafts) obtained per technique on each side (after two sessions) was recorded along with the "residual hair" density on both sides. From this data, the total amount of hair that FUE only, FUT only, and Combination FUT/FUE could potentially obtain was calculated and compared. Hair Mass Index and Coverage Value were also determined to support the findings.

Conclusion: More hair and grafts were obtained using combination FUT followed by FUE than by either technique alone. Although many practitioners feel that using FUE only can take care of the hair loss needs of most patients, there may yet be a population of patients who will benefit from the ability to harvest a higher number of grafts. It is important for hair transplant surgeons to have options available to give patients maximal donor if desired.

INTRODUCTION

While every patient is unique, two critical goals are always the same during hair transplantation: to fulfill a patient's short- (and long-) term goals with respect to naturalness and density in the recipient area, while at the same time taking good care of the donor region. The degree of density and coverage that can be created is primarily a function of graft yield and available donor supply. Therefore, it would be beneficial to use a technique (or a combination of techniques) that ensures the best survival as well as the ability to harvest the maximum amount of grafts with minimal harm to the donor area. Although in the past concern existed over graft yield with follicular unit excision (FUE), recent studies have shown that with modern high-quality techniques, the yield of FUE and FUT (linear strip) are equivalent.¹ However, with respect to which approach is best for maximizing the donor supply over the life of the patient, differences of opinion continue to exist. One issue most physicians agree on is that limited donor supply is often a major obstacle to meeting patients' goals with respect to density and coverage.

How much hair can the donor area deliver? Each patient is different, which makes answering this question challenging. Donor area management has become a more prevalent topic as FUE has become a popular and powerful technique. Different ways of assessing the donor area have also emerged. Coverage Value (CV) and Hair Mass Index (HMI) are two such measurements of the "amount" of cosmetically useful available donor.

What is the optimum technique to use to obtain the most grafts (total hair) for a patient? Some feel that

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President's Message



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The Day after FUE Crashes

This is NOT about Follicular Unit Excision (FUE) extinction, but about its reputation. This is inevitable: stocks, companies, agencies, countries, anything that grows

exponentially without proper quality control will suffer this, the crash. History is full of examples; there is a long list. The stock market crash of 1929 is enough to illustrate this.

Fraudulent, Illicit, Greedy Hair Transplant (FIGHT) clinics—also known as the "black market"—are at the root of the problem: easy money, misleading marketing, and greedy entrepreneurs is the recipe for the disaster. This explosive combo would be dangerous for any market, but in medicine? Wow, besides the fact that this black market is unethical, it could certainly tarnish HT's good reputation.

For sure the problem is not FUE itself, but the use some unprincipled practitioners are making of it. Though we originally reacted perhaps not boldly enough in our attempts to address this problem, we must take responsibility and assume that burden on our collective shoulders. We are moving fast <u>now</u>, and more aggressively, and we are more united than ever on this campaign. Today, by staying truly united, we have an opportunity to improve things.

We have also to thank the companies of FUE systems and supplies that did not embrace the FIGHT clinics and that remained focused on surgeons performing surgery, for the good of the patients. The problem is not the gun itself, but who is pulling it trigger.

So what does this mean? FUE will NOT disappear, that's for sure. But we have to be prepared with answers for the public, because we will be questioned by them: How could this happen? and Why did we allow it to? We need to offer great answers in order to restore our credibility on HT: Why should they trust us? Our first answer for this reflects our high ethical and professional standards: **"Only surgeons performing surgery"**—that is our <u>ideal goal</u>.

On the other side, FUE is not the only available technique and FUT is part of the equation for donor area management. As FUT would be a relevant part of the answer, we have to remember the "sins" made from FUT in the past—and maybe at the present—that finally, as a reaction, lead to FUE's huge popularity and caused FUT to decline.

- FUT sins include the following:
- Multiple FUT small sessions
- Multiple stacked scars are produced
- Donor area distortions, nerve numbness, and vascular distortion can occur
- Donor area closing tension, leading to wide scars and donor area depletion caused by ischemia
- Improper graft cutting leads to poor hair growth.
- Implantation time is too long causing grafts to suffer and thinning hair

Fight The FIGHT

Fight the Fraudulent, Illicit & Grave Hair Transplants

#FightTheFIGHT

For conceptual purposes only; final logo still in development.

- Graft trauma can lead to such inflammatory reactions as lichen planopilaris, which affects the recipient area
- Improper FUT surgical training
- Improper FUT graft cutting supervision
- Large numbers of grafts with less hair per graft generates higher profits for the clinic, but no more hair for the patients

This is old time FUT. Therefore, if FUT will rehabilitate trust in the surgeon over HT, it is better for us to fix all its issues or we will keep running in circles and there will be no hope for anyone: patients or surgeons. We need to <u>update</u> to FUT 2.0, <u>urgently</u>. This is possible and some have done it already, but we need to face these problems. To start, FUT surgeons have to be <u>humble</u> and approach the list above and to craft a sustainable answer. Let's start this discussion at the approaching World Congress in Bangkok.

At the end of the day, we have two kinds of clinics:

- 1. the one that cares about <u>the tomorrow of their patients</u> *or*
- 2. the one that just cares about <u>the patient for tomorrow</u>: FIGHT, the black market clinics.

Are you ready to fight the FIGHT?

Please Join the ISHRS Annual Giving Fund and help in our Fight the FIGHT campaign with a donation! It is crucial that we have member support. Please make a donation to help support the battle against the unlicensed practice of medicine. To donate to the Fight the FIGHT campaign, go to:

https://ishrs.org/make-a-donation/

Co-editors' Messages

Andreas M. Finner, MD, FISHRS Berlin, Germany forumeditors@ishrs.org

As our next World Congress approaches, it is time to look back and make plans for the future. In recent years, we have further refined hair surgery. Dedicated colleagues have developed finer instruments. We use microscopes. Thus, we are now

able to minimize trauma to the hair follicle and to the scalp. Digital imaging can help to assess the hair situation. Careful anesthesia can significantly reduce patient discomfort, as described in the article by Seema and Anil Garg.

What remains a constant challenge, though, is the correct application and choice of technique in each individual patient. The goal should be to avoid a one-size-fits-all approach and assembly-line surgery.

In this context, I applaud the excellent article by David Josephitis and Ron Shapiro calculating the possible yield with FUE, FUT, and a combination of both. It again proves the concept that a combination of both harvesting techniques will increase the number of potentially available donor hairs for many patients.

I actually addressed the same question in the talk I gave at the Hair Research World Congress in Barcelona in April. I measured the quality index of grafts obtained by FUE and FUT in the same patient (it was higher in FUT) and I also calculated the potential yield for different scenarios of FUE and FUT or their combination. I came to the same conclusion. Combining both techniques increases the graft and hair yield while decreasing the potential risk of overharvesting or harvesting outside of the safe zone in high-density FUE and a wide scar from multiple FUTs. Whether the first surgery should be FUE or FUT is another issue that has to be decided individually.

What are the practical consequences from this insight? All patients should be counseled about FUE and FUT. Hair surgeons should ideally master both techniques or cooperate with colleagues. In this way, they can offer more hair to many patients with (potentially) advanced alopecia. Starting with FUT or adding it to FUE is especially indicated in patients with a narrow safe donor area or fine and curly hair and those who never plan to wear their hair too short. Thus, FUT is definitely still a relevant and important part of the treatment spectrum for suitable patients. Hair surgery should be combined with medical treatment and can be complemented with scalp micropigmentation (SMP).

I am looking forward to trying new instruments and discussing new ideas during our World Congress and Live Surgery Workshop in Bangkok.

What are your personal thoughts and observations? Send them to forumeditors@ishrs.org.



Bradley R. Wolf, MD, FISHRS *Cincinnati, Ohio, USA* forumeditors@ishrs.org

When we began our term as Co-editors, our goal was to present the membership with the most current information. In this, our second to last issue, we do that by presenting a variety of current and avant garde topics. Bill Rassman reports on a new

"needleless microjet injector that uses laser pulse energy to inject tattoo pigments for scalp micropigmentation." Another in a long line of clever instruments from Bill. He thinks this device, or a future variant, is likely to replace the system he uses for SMP. Greg Williams, in another excellently written column, explores the ethics of robotics and automation. And in a third forward-looking piece, Vlad Ratushny reports on a study of human embryonic stem cells and human-induced pluripotent stem cells. This study is a little complicated but is a blueprint for the future. Familiarize yourself with the language; the subject of stem cells has been one of the most popular topics at recent meetings and will be heavily covered in Bangkok.

In our three years as Co-editors, most articles concerning surgery have been about FUE. In this issue, FUT makes a comeback. In his President's message, Arthur writes about FUT as "part of the equation for donor area management" and the "need to update to FUT 2.0...." Two of our feature articles do just that. Seema and Anil Garg present a study on techniques to decrease pain when performing FUT: decreasing strip width and injecting a long-acting anesthetic after strip excision. Our cover article by David Josephitis and Ron Shapiro is an ambitious and well-designed study taking place over two years in two patients who had two procedures, FUE and FUT, performed at the same time, twice. Their conclusions were that more grafts were obtained on the FUT side, residual donor density was greater on the FUT side, and FUT plus FUE yielded more grafts. When done properly, FUT is unarguably more efficient than FUE. That is important news! So why are some trying to relegate FUT to historical footnote status?

Both studies above and my experience (see my editor's note on page 188) indicate that a strip of no greater than 1.5cm wide yields at least 2,000-3,000 grafts, causes less pain, and yields acceptable donor scars compared to wider strips. Although strip width and graft numbers can't be regulated, to prevent wide scars and reduce pain, strips over 1.5cm wide and sessions of over 3,000 grafts should probably be discouraged. I would add this to Arthur's "FUT 2.0 update."

This year all roads and flight paths lead to Bangkok. Robin, Victoria, and the program chairs have been hard at work creating another Congress likely to be the best ever. Preliminary numbers indicate it could be the biggest meeting yet. Safe travels and I look forward to seeing all in Thailand.



Notes from the Editor Emeritus, 2008–2010

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Recommendations for Happiness from a Cell Biologist

The thousands of self-help books that can be found on the internet are written by people from a wide range of backgrounds: from profes-

sional writers who have come across a flourishing niche for making easy bestsellers to authors with non-specific pseudo-philosophical backgrounds or whose main ideas tend to come from plagiarizing well-known religious (mainly Buddhist) traditions. However, it is extremely rare to find a selfhelp book written by a highly prestigious biologist. One such book was authored by Carlos López Otín, Professor of Biochemistry and Molecular Biology at the University of Oviedo (Spain). Considered one of the top-ten researchers in Europe in his field, the identification of cancer-associated genes and a description of genetic defects in hereditary diseases such as premature aging are just two of the many important contributions he has made to the scientific body of knowledge.

However, what perhaps sets Professor López apart from his peers most is the exceptional change that he underwent in terms of his well-being. From a cheerful person with astonishing scientific productivity (more than 500 papers published in top journals such as Nature or Cell), his descent into a profound depression was sudden and rapid. It all started when a few colleagues-who claimed to have uncovered irregularities in some of his papers-made uncomplimentary comments that, thanks to the power of the internet, spread rapidly and began to damage his reputation. López Otín wrote his book during the subsequent period of depression, therapy, and total isolation that he went through. Titled "La vida en cuatro letras" (Life in four letters, though not translated yet into English as far as I am aware), he describes in his book what he considers to be the five keys to happiness: Imperfection, Repair, Observation, Introspection, and Motion.¹

Imperfection, the first key to happiness, involves the need to accept our Imperfections and limitations as human beings. We should not be afraid of making mistakes, become obsessed with achieving perfection, or set ourselves targets that are over ambitious and exceed our natural abilities. His second key to happiness concerns Repair, which can be defined as the capacity and determination to recompose our lives and emotions from whatever has compromised our happiness. As a Japanese proverb says: "ana korobi ya oki" (if you fall down seven times, get up eight). The third key is Observation, which involves being curious and alert to what is happening in the present by opening our senses and mind. In 2010, Killingsworth and Gilbert from Harvard University published in the journal Science an article titled "A wandering mind is an unhappy mind."² The paper aims to clearly demonstrate in quantitative terms what many philosophical and religious traditions teach: that happiness is to be found by the living moment. A wandering mind means that human beings, unlike

other non-rational animals, spend a lot of time thinking about what is not going on around them, contemplating events that happened in the past, might happen in the future, or will never happen at all. While it may be a remarkable evolutionary achievement that allows people to learn, reason, and plan, unfortunately, this "ability to think about what is not happening," or "mind-wandering," has a heavy emotional cost.

The fourth key revolves around Introspection. It is very helpful to spend a few minutes every day, in silence, thinking about our purpose in life (each one of us may have different purposes). The practice of meditation can help to achieve this goal and seems to benefit our emotional wellness. As a result of intensive clinical tests at the University of Wisconsin, Matthieu Ricard, a French biochemist who abandoned his scientific career and became a Buddhist monk practicing meditation, is frequently described as the happiest man in the world. Researchers at the university who measured the neurological activity of a group of volunteers using state-of-theart technology found that, when meditating, Ricard achieved unprecedented brain activity in the left prefrontal cortex, the part of the brain responsible for positive emotions, demonstrating a minimal tendency to emotional pessimism (Lutz).³

Finally, the last, but by no means the least, important key to happiness centers on Emotion. Scientifically speaking, emotions surfaced for the first time some 600 million years ago with the appearance of the first specialized nerve cells and primitive nervous systems. Studies show that positive emotions contribute to improved health and can offset the biological damage caused by the adversities inherent to life. We need to place our emotions at the center of our lives, living everything with intensity whatever the source of these emotions (Fredrickson), and striving to attain Lagom, the Swedish recipe for happiness, or Hygge, the Danish ideal of the Danish concept of comfort and well-being.^{4,5}

I hope that these keys to happiness inspire you as much as they have inspired me, and that I have sufficiently aroused your curiosity to read this book, especially as it is written by a person from a scientific background who experienced the sudden disappearance of happiness from his life due to circumstances that could happen to any one of us at any time.

References

- 1. López Otín, C. La vida en cuatro letras. Paidós, 3rd Edition, 2019.
- 2. Killingsworth, M.A., and D.T. Gilbert. A wandering mind is an unhappy mind. *Science*. 2010; 330:932.
- 3. Lutz, A., et al. Long-term meditators self-induce high amplitude gamma synchrony during mental practice. *PNAS*. 2004; 101:16369.
- 4. Fredrickson, B.L., et al. A functional genomic perspective on human well-being. *PNAS*. 2013; 110: 13684-9.
- 5. Akerstrom, L.A. LAGOM: The Swedish Secret of Living Well. 2017.

FUT provides the greatest number of total grafts over the patient's lifetime. Others believe that with the larger donor area available with FUE (albeit not all in the "SAFE" donor area), more grafts can be obtained.²⁻⁴ Still others believe that a combination of the two techniques can give surgeons the extra donor needed to meet the needs of those patients looking for the most coverage and density possible. ("Combination" here refers to FUE being done during subsequent procedures and *NOT* at the same time as FUT as some physicians also do.)

The purpose of this study was to evaluate the difference in the amount of hair that can be harvested with different methods (or a combination of methods) in the same patient. By using a split-head donor study, it is possible to more accurately compare FUE and FUT harvesting techniques in the same patient. This study looks at two patients using both FUE and FUT over the course of two successive hair transplant surgeries and compares their hair totals. In addition, the theoretical number of extra hair available using FUE in addition to FUT (also known as "combo" FUT/FUE) was also calculated. The hope was to get more insight into the difference in donor supply available with different approaches. From a practical standpoint, the focus was more on the difference between using FUE only versus combination FUT/FUE. In reality, very few physicians perform only FUT anymore as it has become common for FUT surgeons to add FUE to their practices. However, with the trend for the majority of new physicians entering the field learning FUE only, this potential difference in donor availability is an important question to explore.

STUDY DESIGN

Patient selection

Two male patients between the ages of 45 and 60 years old were enrolled in the study. Both patients were Norwood Class V or greater and neither had prior hair transplantation or were using hair loss preventive medications. The study design described below was the same for both patients. One patient's preoperative photos are shown in Figure 1.

FIGURE 1. The pre-op photo for one of our two study patients is shown. A: Front view; B: top view; C: posterior donor view.



Donor harvesting design

The donor area was divided in half at the posterior midline. As part of the study design, both patients had two sessions, one year apart, during which the left side was harvested by FUE and the right side by FUT strip (Figure 2). At each session, the FUT-strip side was harvested first, and the FUE side was harvested immediately after the strip incision was closed. *FUT side:* The FUT-strip side (patient's right side) was harvested in the safe area at the level of the occipital notch. In both cases, the same physicians, with more than 30 years of FUT experience, removed the

strip, which was

harvested with





a "safe" maximum width and a maximum length extending from midline to the anterior ear. The "safe" width was determined by measuring donor laxity using a laxometer. The goal was to harvest as many grafts as possible while maintaining an easy closure. Strip width ranged from 1-1.5cm. The same technicians, with more than 15 years of FUT experience, microscopically dissected the strip into 1-, 2-, and 3-hair grafts.

FUE side: At each session, the FUE side (patient's left side) was harvested immediately after the strip incision was closed. The extended safe area described by Cole was used to guide the limits of the excisions.⁵ This FUE donor area ranged from 105-120cm². For perspective, this would translate into 210-240cm² if the both sides (the entire donor area) had been used for FUE. The WAW FUE system and a 0.9mm-diameter punch was used. The same physicians, with 9+ years of FUE experience, harvested the grafts in both patients. The grafts were then sorted under a microscope into 1-, 2-, and 3-hair grafts. The proposed goal was to

harvest ~40% of the total grafts from the FUE side over two sessions by harvesting ~20% at each session. To accomplish this, digital imaging was used to count the starting FU/cm² as well as the number of FUs (and percent) harvested after each session. By doing this, the authors were able to determine (and get) the correct number of grafts needed over



FIGURE 3. Example of digital photo and measurement taken before and after each surgery to document the

average FU/cm harvested with FUE. These photo and

numbers were used to help us harvest a cumulative

two sessions to equal 40% (Figure 3).

Follow-up parameters

Data from both sides of the donor area were collected before and one year after each surgery. Data taken and compared included the following:

- Follicular unit density and hair density
- Coverage value (CV)
- Hair Mass Index (HMI)
- Gross photography at normal length, at slightly greater than 1cm, and at less than 1cm
- Subjective patient assessment of donor look and feel
- Actual total number of hairs harvested on each side with each technique

At the completion of the study, the following was able to be calculated and compared:

- Total number of hairs that could be obtained if the procedure was done completely using one method or the other using the whole head (not just half)
- Theoretical number of hairs obtained if Combination FUT/FUE was used and how that would compare to using FUE only in the same patient. (Some practitioners use FUE in addition to FUT during the same procedure to increase the total number of grafts. This study is *NOT* looking at this. Instead, it is looking at the use of both procedures over time in order to maximize lifetime graft totals).

RESULTS *Post-procedure (residual) donor hair density*

FIGURE 4. Example of digital photo and measurement taken to document residual hair density (hair/cm). before and after each surgery. This particular photo shows residual hair density on the FUE side in the parietal area.



Post-procedure (residual) hair density is the density left over in the available donor area after harvesting has been done by either technique. Using digital photography, both the follicular unit and hair density was evaluated before and after the two surgeries (Figure 4). The FUE side had ~40 % of the original FU density extracted over two sessions. The FUT side underwent two

maximal safe width excisions per session. Residual density measurements were taken in the occipital, parietal, and temporal areas. On the strip side, measurements were taken above and below the scar and averaged.

Although both FU and hair density were measured, for the purpose of this study only the hair density is presented, because it is a more accurate reflection of change of the donor supply. This is because FU grafts vary with respect to the number of hairs/grafts.

Table 1 compares the residual hair density on the FUE vs FUT side before and after the two surgeries. The residual hair density hair was higher in all areas in both patients on the FUT side compared to the FUE side. The average residual hair density for FUE was 119 hairs/cm² vs 146 hairs/cm² for FUT.

TABLE 1. Hair Density in Donor Before and After Two Sessions of Hair Transplantation

	BEFORE HT	AFTER HT		
Patient #1	Both Sides	FUE Side	FUT side	Difference in FUE
	(hair/cm2)	(hairs/cm2)	(hairs/cm2)	vs. FUT (hairs/cm2)
Occipital	176	110	142	32
Parietal	175	110	137	27
Temporal	169	99	116	17
AVERAGE	173	106	132	26
Patient #2				
Occipital	225	173	188	15
Parietal	210	115	164	49
Temporal	182	107	129	22
AVERAGE	204	132	160	28
2 PATIENT AVERAGE	189	119	146	27
2 PT AVERAGE DIFFERENCE IN HAIR DENISITY WAS - 27 HAIRS/CM HIGHER FOR FUT SIDE				

Coverage Value

Coverage Value (CV) is another way of evaluating the donor area supply. It combines hair density and hair caliber into one number.⁶ Average starting CV in most patients is about 12; a patient's donor area may begin to look thin if the CV drops below 6. CV values are a useful way to follow and compare donor supply in different areas of the scalp before and after surgery.

Table 2 shows the change in CV on the FUE vs FUT side before and after the two sessions in the occipital, parietal, and temporal areas. On the FUT side, the CV was taken above and below the scar in each area and averaged. The CV decreased after surgery on both sides, and the FUE side experienced a relatively greater decrease compared to the FUT side.

Table 2. Coverage Value in Donor before and after Two Sessions of Hair Transplantation*

	BEFORE HT		AFTER HT	
Patient #1	Both Sides	FUE Side	FUT Side *	Difference FUE vs FUT
Occipital	11.0	6.6	8.5	1.9
Parietal	10.5	6.6	8.2	1.6
Temporal	9.3	5.9	7.0	1.1
Patient #2				
Occipital	15.8	12.1	13.2	1.1
Parietal	14.0	8.1	11.5	3.4
Temporal	12.7	7.5	9.0	1.5
2 PATIENT AVERAGE	12.2	7.8	9.6	1.8
2 PT AVERAGE. DIFFERENCE IN COVERAGE VALUE WAS = 1.8 HIGHER FOR FUT SIDE				

*Note: Coverage value in each area on FUT side was an average from above and below the scar.

Hair Mass Index

Hair Mass Index (HMI) is another way of measuring the amount of donor hair and is found by using a hair check device, which measures the area of hair within a cm². Table 3 shows the HMI on the FUE vs FUT side before and after two sessions. Unfortunately, no initial HMI was taken before surgery. However, the assumption can be made that the starting HMI was the same on the left (FUE) side and right (FUT) side of a patient before surgery. The data seems to indicate that after surgery the HMI on the FUT side remained slightly higher than that of the FUE side. On the FUT (strip) side, the CV was averaged from measurements taken above and below the scar.

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TABLE 5. Hall Mass index (HMI) in Donor after Two Sessions of Hall Hallsplantation				
	R & L Lateral Areas		R & L Medial Areas	
	FUE Side	FUT Side*	FUE Side	FUT Side*
Patient #1	57	64	70	73
Patient #2	59	61	65	66
2 PATIENT AVERAGE	58	62.5	67.5	69.5
2 PT AVERAGE. DIFFERENCE IN HMI WAS = 3 UNITS <u>HIGHER</u> FOR FUT SIDE				

*Note: On the FUT strip side, the CV was averaged from above and below scar.

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Subjective patient assessment

After one year, both patients were informally questioned about their donor areas. Neither patient reported any issues with their donor areas on either side of the scalp after normal haircuts or during normal daily routines. One patient did note, however, that the FUE side felt "less thick" than the other side (FUT) when he put his hands through it.

Gross photography

Figure 5 shows the donor area after two sessions at lengths above and below 1cm. Both the strip scar and FUE scars were undetectable at a 1cm length. At less than 1cm length, the FUE scars remained undetectable. At less than 1cm length, the strip scars remained for the most part undetectable but were slightly noticeable at certain angles. When shaved, both types of scars could be seen, but the FUE scarring was only visible with critical examination and aesthetically less displeasing than the faint strip scar.

FIGURE 5. Photo of patient #1's donor area 12 months after two surgeries at both above 1cm and below 1cm. Above 1cm, the strip scar is not visible; below 1cm it is slightly visible in this case.



Hairs harvested per side with each technique in two sessions during study

The actual number of hairs obtained from each half head in two sessions using FUE on one side and FUT on the other is shown in Table 4. The number of hairs obtained in two sessions was slightly greater for FUT than FUE in both patients.

TABLE 4. Actual Hairs Obtained per Technique on Each Half Head (One Side) after Two Sessions

Actual Hairs – FUE Actual Hairs – FUE (Half-Head FUE Side) (Half-Head FUT Side)		Actual Hairs – FUT (Half-Head FUT Side)	
Patient #1	5,700	6,664	
Patient #2	6,932	7,295	
2 PATIENT AVERAGE	6,316	6,980	
2 DT AVERAGE DIFFERENCE IN HAIDS OPTAIN FROM FUE WE FUT SIDE WAS: - 664 HAIDS HICKER FOR FUT SIDE			

Hairs obtainable if only one technique used for the whole head in two sessions

The number of hairs that would be obtained if the wholehead (both sides) had been harvested using the same technique is calculated and shown in Table 5. This is calculated by simply multiplying the half-head numbers by 2.

TABLE 5. Calculated Hairs that Would Be Obtained for Each Technique If the Whole Head (Both Sides) Was Used for Two Sessions

	Calculated Hairs – FUE	Calculated Hairs – FUT
	(Whole Head)	(Whole Head)
Patient #1	11,400	13,328
Patient #2	13,864	14,590
2 PATIENT AVERAGE 12,632 13,959		
2 PT AVERAGE. DIFFERENCE HAIRS PER TECHNQUE FOR WHOLE HEAD WAS = 1,327 HAIRS <u>HIGHER</u> FOR FUT		

Calculated hairs obtainable if Combination FUT/FUE used on both sides as compared to FUE Only

The main purpose of this study was to look at the difference in donor supply (hair) available in the same patient if combination FUE/FUT was chosen to harvest grafts as opposed to FUE only. It has been proposed that by combining both techniques (at different times) more hair can be harvested over a patient's lifetime than by using FUE exclusively.

The theoretical amount of hair that could be obtained with combination FUE/FUT instead of FUE only was calculated in the following way:

- As described above, two patients had two surgical procedures a year apart, during which the left side of their head was harvested by FUE only and the right side by FUT strip only.
- The beginning and post-procedure (residual) hair densities on both sides of the head were measured in three areas—occipital, parietal, and temporal—as well as above and below the strip in order to get the most accurate measurements.
- The exact number of hairs that had been harvested from the two procedures on the FUE-only and FUT-only sides of the head was determined. (Table 4.)
- The post-procedure hair densities from both sides of the head were also determined. (Table 1.) This table shows that the hair densities are higher on the FUTstrip side than FUE side.
- The theoretical number of extra hair available using FUE in addition to FUT (combo FUT/FUE) could now be calculated. Additional FUE grafts (hair) could theoretically be harvested on the strip side to the point where the hair densities would become the same on both sides. (Bringing the residual density on the FUT side down to the residual density on the FUE side. This was done by taking the difference in residual hair density from the FUT side compared to the FUE side and multiplying that number by the surface area to be harvested. The surface area on the FUE and strip sides was the same. (The area was decreased on the strip side by 1cm × strip length to compensate for area that may not be harvestable due to scar.) The value obtained for a single side was then doubled to get the total number of hairs for the whole head. Calculations using the Coverage Values (Table 2) provided similar results.

Table 6 shows that Combo FUT/FUE in our two patients would be able provide an additional 6,712 to 6,448 hairs (3,196 to 3,070 grafts) compared to FUE only if used in the same patient, and the donor area is brought to the same post-procedure hair density, or CV.

TABLE 6. Comparing Combo FUT/FUE to FUE Only: Calculated Extra Hairs (Grafts) Potentially Obtained If Combo FUT/FUE Was Used Instead of FUE Only on the Whole Head of Same Person

FUE Only Total Hairs Combo FUT/FUE Total Hairs Combo FUT/FUE Additional Hairs Combo FUT/FUE Additional Grafts			Combo FUT/FUE Additional Grafts
Patient #1 11,400 18,112 6,712 3,196			
Patient #2 13,864 20,312 6,448 3,070			
2 PT AVERAGE INCREASE IN GRAFTS BY DOING COMBO FUT/FUE = 3.133 Grafts			

*Value of 2.1 hairs/graft was used to calculate number of grafts from number of hairs

CONCLUSION

As stated above, meeting a patient's expectations of density and coverage (both initially and as they age) is one of the most important goals in hair restoration. The degree of density and coverage that can be created over a patient's lifetime is largely determined by the amount of donor follicles that can safely be harvested while inflicting minimal harm to the donor area. Therefore, knowing the maximum donor follicles that can be harvested and how this varies with different techniques is important for patient planning.

This study attempted to look at the difference in hair totals that could be obtained in the same patient if the donor area was harvested using FUE only, FUT strip only, or a combination of FUE/FUT. From a practical standpoint, since very few surgeons do FUT strip only anymore, the most important question to address was the difference between combination FUE/FUT vs. FUE only. These results are even more important, since in recent years, more physicians are learning FUE only and losing the ability to provide a combination approach.

The data seems to indicate that by using the Combo FUE/ FUT method, more hair can be obtained in the same patient than if FUE only is used:

- First, more grafts were obtained on the FUT-only side than the FUE-only side after two sessions. (Tables 4 and 5)
- Second, the post-procedure residual hair density, CV values, and HMI were greater in the remaining donor area on the FUT side than on the FUE side after these two sessions. (Tables 1, 2, and 3)
- Finally, by doing a split-head study, the additional number of extra hairs (or grafts) that theoretically could be obtained from the FUT-only side by subsequently performing FUE (Combo FUT/FUE) could be calculated by estimating how many additional hairs could now be harvested from the strip side to the point where the residual hair density on both the strip and FUE sides became the same.

This study showed an actual increased number of hairs obtained by using Combo FUT/FUE in the two patients. Obviously, these results need to be verified, but they seem consistent with what has been empirically reported by physicians using both FUT and FUE in the same patient over time.

Existing questions that need to be answered include the following:

- If these differences in donor yield are accurate, is it clinically significant? From a logical standpoint, since both techniques can usually obtain at least 6,000 grafts over the life of a patient, and most patients can be satisfied with 6,000 grafts; then either technique can satisfy a large number of patients.
- Is there a population of patients where these extra grafts would be important to meet their expectations of coverage? And, if so, what percentage of patients (how large of a sub-population) fall into a category where this will be clinically important: 10%? 20%?
- Will practices that use FUE only be able to deliver the same degree of coverage in this sub-population of pa-

tients over their life as physicians that have the ability to perform combination FUT/FUE? And, if not, is the difference in results clinically significant and worth the risk of a scar?

- On other hand, is the increase in donor supply that FUE has provided from beard and body hair enough to make this difference less significant?
- The concept of the "SAFE" donor area developed by Unger has been helpful during FUT for obtaining grafts not affected by DHT.^{5,7} Many grafts (especially after multiple FUE sessions) are harvested outside of the "SAFE" donor area. This is done partly to obtain more grafts as well as to avoid a "window" effect (central thinned area surrounded by denser hair) in the donor area. How many of these FUE grafts harvested from the "less SAFE" donor area (LSDA) are destined to be lost during the patient's lifetime? (Some estimate the total FUE grafts in this area range from 10-30% of the total number.) How does this additional loss of grafts from the LSDA affect the difference in graft total with FUE only vs Combination FUT/FUE?

Many patients may never need the hair totals that the combined techniques can deliver. For a great many of the patients that are cared for, FUE alone can provide a very impressive and long-lasting result. However, the questions posed above about a sub-population that may need the higher number of grafts offered by Combination FUT/FUE need to be answered. This is important, especially due to the trend towards an ever-increasing number of FUE-only clinics opening worldwide. FUT in conjunction with FUE may be helpful for a population of patients that require more grafts to meet their needs. The exclusive use of FUE, although an amazing and elegant technique, may not be everything for every patient. FUT is still a valuable and powerful tool in the arsenal of the hair restoration surgeon. Further studies need to be performed to determine who is a better candidate for one technique or a combination of techniques.

References

- 1. Josephitis, D., and R. Shapiro. FUT vs. FUE graft survival: a sideby-side Study of 3 patients undergoing a routine 2,000+ graft hair transplantation. *Hair Transplant Forum Int'l.* 2018; 28(5):179-182.
- Pathomvanich, D. FUT fights back. *Hair transplant Forum Int'l.* 2015; 25(5):177, 183-184.
- 3. Various authors. Physicians sound off: FUT vs. FUE. *Hair transplant Forum Int'l.* 2015; 25(5):185-187.
- 4. Beehner, M. FUE vs. FUT-MD: study of 1,780 follicles in four patients. *Hair transplant Forum Int'l*. 2016; 20(1):160-161.
- Unger, W. The Donor Site. In: W. Unger, ed. *Hair Transplantation*, 3rd Edition. New York: Marcel Dekker Inc., 1995; pp. 183-212.
- 6. Erdogan, K. Gigasessions with FUE: How to Avoid Complications. In: Pathomvanich and Imagawa, eds. *Practical Aspects of Hair Transplantation in Asians*. Springer. Chapter 31.
- 7. DeVroye, J. Donor Area Harvesting. In: W.P. Unger and R. Shapiro, eds. *Hair Transplantation*, 5th Edition. London: Informa Healthcare, 2011; pp. 257-258. ■

Study of Ropivacaine Block to Reduce Post-Operative Pain after Strip Harvesting, and the Relationship of Strip Width to Post-Operative Pain

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ABSTRACT

Introduction: The strip method of follicle harvesting (FUT) has great advantages but post-operative pain and the fear of pain are common complaints of this surgery. The severity of post-operative pain is in direct relation to the width of the strip harvested. It is mandatory to reduce post-operative pain to make this method more acceptable for patients.

Objective: Our objective was to determine the effect of strip width and ropivacaine (a long-acting local anaesthetic) infiltration on post-operative pain after strip excision (FUT) surgery.

Method: Grading was performed by the authors for the severity of post-operative pain and post-operative sleep disturbance. In Study I (control), the initial data, pain severity, and sleep disturbance was collected from patients on whom a 2cm-wide strip was excised centrally and 1.5cm-wide strip was excised laterally. In the test group, post-operatively, ropivacaine 0.5% was infiltrated below the suture line after 2cm-wide strip excision. In Study II, the strip was excised 1.5cm centrally and 1cm laterally. Again in the test group, ropivacaine infiltration was performed post-operatively while in the control group no ropivacaine was infiltrated. Data was collected and analysed.

Observation: There was significant pain in patients where the strip width was 2cm centrally as compared to patients where the strip width was 1.5cm centrally. There was significant reduction of pain in those with strip width 1.5cm centrally and infiltration with ropivacaine was done.

Conclusion: The severity of pain is directly proportional to the width of strip harvested. The post-operative infiltration of ropivacaine 0.5% along the suture line significantly reduced post-operative pain.

Key words: FUT, post-operative pain, ropivacaine, strip width

INTRODUCTION

The strip excision method of follicle harvesting (FUT) has significant advantages as well as some disadvantages, most of which are due to technical errors. Post-operative pain and the fear of pain are common drawbacks of this surgery. Post-operative pain is due to tension on the suture line. The greater the width of the strip, the more tension on suture line, and therefore the greater post-operative pain in the donor area. The quality of the scar, its width, and formation of hypertrophic scars or keloids depend mainly on the tension on the suture line.^{2,4,5}

Two studies were done with two objectives: 1) to study post-operative pain in relation to the width of the harvested strip, and 2) to study the effect of injecting a local anaesthetic agent, ropivacaine 0.5%, below the suture line area to see if it affected post-operative pain. In Study I, the harvested strip width was 2.0cm centrally and 1.5cm laterally. In Study II, the width of the strip was reduced to 1.5cm centrally and 1.0cm laterally. In both test groups, ropivacaine 0.5% was injected below the suture line, blocking all posterior nerves post-operatively, while in the control group, ropivacaine infiltration was not performed.

OBJECTIVE

The study was done to determine the following:

- The effect width of the excised strip had on post-operative donor site pain.
- 2. The effect of ropivacaine infiltration post operatively on donor site pain after strip excision harvesting.

METHOD

All patients included in this study were males who underwent hair transplantation surgery using the strip excision method (FUT) of follicle harvesting. The study was completed over a 3-year period. Cases on whom a second strip was done were excluded from this study. Patients ranged in age from 23-55 years and had androgenic alopecia, Norwood grades IV-VII. In a single sitting, 2,500-3,300 grafts were done in each patient. Two studies with a similar technique of wound closure after strip excision were done during different time periods under the same operating conditions and by the same surgeon's team.

In Study I, strip width was 2cm centrally and 1.5cmwide laterally. In Study II, strip width was 1.5cm centrally and 1.0cm laterally. In both test groups, infiltration of local anaesthetic ropivacaine 0.5% was injected; in the control groups, no local anaesthetic was given. All patients went home on the same day and were called by phone 4 and 18 hours after surgery. Specific questions were asked concerning post-operative pain, such as did they have pain and, if yes, the severity of the pain. The severity was graded as very severe, moderate, or minimal. Another set of questions related sleep quality to the severity of the pain. All answers were recorded by an assistant and reported to the author in the morning and patient pain was graded as per pain grade described below.

"Pain grading" given by the author for the patient's postoperative pain and sleep disturbance included the following:

Grade I: Minimal or no pain and could sleep well Grade II: Severe pain with disturbed sleep because of pain Grade III: Severe pain and could not sleep because of pain

ROPIVACAINE 0.5%

Ropivacaine is a safe, long-acting local anaesthetic with the least cardiac and central nervous system toxicity.^{1,3} It has greater selectivity for sensory blockade and shorter motor block. DOSE: 3-5mg/kg. The authors have used this anaesthetic for last for the last four years in all cases of hair transplant surgery.

OBSERVATIONS—STUDY I Study I Control Group

In the Study I control group, all 50 patients had strip width of 2cm in the central occipital region (centrally) and 1.5cm in the lateral mastoid and/or supra-auricular region (laterally). No infiltration of anaesthetic was performed on the donor site post-operatively. The complaints of pain, its severity, and sleep problems were collected from patients. Study I control group results were as follows:

- Grade I (minimal or no pain, slept well): 10 patients, or 20%
- Grade II (pain with disturbed sleep): 25 patients, or 50%
- Grade III (severe pain, could not sleep): 15 patients, or 30%

Study I Test Group

In the Study I test group, 50 patients were also selected. We infiltrated approximately 10ml of 0.5% ropivacaine below the suture line, blocking all posterior nerves (greater and lesser occipital and post-auricular nerves). In this study, the test group strip width was the same as in the control group (2cm centrally, 1.5cm laterally). Study I test group results were as follows:

- Grade I (minimal or no pain, slept well): 22 patients, or 44%
- Grade II (pain with disturbed sleep): 18 patients, or 36%
- Grade III (severe pain, could not sleep): 10 patients, or 20%

We observed that complaints of pain were reduced from 80% to 56% in Grades II and III and the pain relief percentage increased from 20% to 44% in Grade I patients. Still, almost 50% of our patients complained of pain (Figure 1).

FIGURE 1. Percentage of patients with post-operative pain with and without infiltration of Ropivacaine, control and study group (strip width 2cm centrally and 1.5cm laterally).

Width 2cm with Control and Test



OBSERVATIONS—STUDY II

All cases had strip width of 1.5cm centrally and 1.0cm laterally. A total of 72 cases were divided into a control group of 12 patients and a test group of 60 cases.

The test group patients were given ropivacaine 0.5% infiltration below the suture line of the strip excision post-operatively. The control group of 12 cases was not given the local anaesthetic post-operatively.

Study II Control Group

Study II control group results were as follows:

- Grade I (minimal to no pain, slept well): 4 patients, or 33.33%
- Grade II (pain disturbed sleep): 5 patients, or 41.66%
- Grade III (severe pain and could not sleep): 3 patients, or 25%

It was noted that after reducing just strip width (ropivacaine was not given post-op), pain was present in approximately 68% of cases (Grades II and III) compared with 80% of the control group with the wider strip in Study I.

Study II Test Group

Study II test group results were as follows:

- Grade I: 53 patients, or 88.33%
- Grade II: 5 patients, or 8.33%
- Grade III: 2 patients, or 3.33%

It was noted that post-operative pain was remarkably reduced (Figure 2). Grade III was only 3.33%, after ropivacaine infiltration, but in the same group without ropivacaine infiltration, Grade III pain was 25%, while Grade II pain was reduced from 41.66 % to 8.33% after ropivacaine was injected. The percentage of patients who were pain free or had minimal pain and could sleep also increased from 33.33% to 88.33%.

Compilation of both studies was done to compare the grading of pain in relation to width and with and without ropivacaine infiltration (Figure 3).



FIGURE 2. Percentage of patients with post-operative pain with and without infiltration of Ropivacaine (strip width 1.5cm centrally and 1cm laterally).

Width 1.5cm with Ropivacaine and

without Ropivacaine

FIGURE 3. Table showing compilation of both study groups.				
Study I: Width 2cm Study II: Width 1.5cm			m	
	Control-Without	Test—	Control-Without	Test—
	Ropivacaine %	With Ropivacaine %	Ropivacaine %	With Ropivacaine %
Grade I	20	44	33	89
Grade II	50	36	42	08
Grade III	30	20	25	03

DISCUSSION

Pain is one of the biggest fear factors in the patient's mind when making the decision whether to undergo hair transplantation. The strip excision method of follicle harvesting has become more unpopular because of the potential for post-operative pain at the donor site. During the initial phase of our hair restoration practice, we experienced this and worked to solve the problem.

Ropivacaine 0.5% is a safe, newer, local anaesthetic with the least cardiac and CNS toxicity we were using for local nerve blocks. We found that local ropivacaine infiltration below the strip incision remarkably reduced the pain as well the anxiety due to pain. During this pain-free period, the patient was able to sleep, but we still were getting complaints about pain. We realised the width of the excised strip could be the cause. We searched the data and found that our usual strip width used to be around 2cm centrally and 1.5cm laterally. We thought about reducing the strip width; pre-operative skin laxity is the main determining factor in deciding strip width. We noted that there was significant reduction in post-operative pain reported by decreasing strip width.

The mechanism of pain is well known. The skin incision itself is not the cause of pain. When there is tension over a suture line or in the area, the nerve endings will be compressed and will cause the pain. The wider the strip of skin excised, the greater the pain in and around the suture line. Even after ropivacaine infiltration, patients felt pain with a strip width of 2cm centrally and 1.5cm laterally. A reduction in strip width reduced the pain reported even in the group where local ropivacaine was not given.

CONCLUSION

The most common complaint after strip surgery is postoperative pain, which is one of the main factors limiting patients choosing strip excision for donor harvesting during hair transplantation.

We found that ropivacaine 0.5% effectively controlled post-operative pain.

The width of the excised strip is directly related to postoperative pain. Therefore, we do not take strips wider than 1.5cm centrally. Even with reduced strip width and good skin laxity, patients will have post-operative pain and sleep disturbance, but this can be significantly reduced by the infiltration of the local anaesthetic ropivacaine 0.5% below the suture line post-operatively.

References

- Simpson, D., et al. Ropivacaine: a review of its use in regional anaesthesia and acute pain management. *Drugs*. 2005; 65(18):2675-2717. Review. PubMed PMID: 16392884.
- 2. Mayer, M.L. Evaluation of scalp elasticity. Chapter 9B, Donor Area Harvesting. In: W.P. Unger, et al. *Hair Transplantation, 5th Edition*. Informa Healthcare: New York, page 264, box 9A2-2.

- . Kuthiala, G, and G. Chaudhary. Ropivacaine: A review of its pharmacology and clinical use. *Indian J Anaesth*. 2011 Mar; 55(2):104-110. doi: 10.4103/0019-5049.79875.
- 4. Seery, G.E. Hair transplantation: management of donor area. *Dermatol Surg.* 2002(Feb); 28(2):136-142.
- 5. Nirmal, B., et al. A study of donor area in follicular unit hair transplantation. J Cutan Aesthet Surg. 2013(Oct); 6(4):210-213. doi: 10.4103/0974-2077.123408. ■

Editor's Note: I have been performing FUT for nearly 30 years and my experience is similar to the authors of this study. FUT can be performed with minimal discomfort using limited strip width and adequate pain control. But there are two additional consequences when excising a strip of reduced width that are not explored in this study. A narrower scar and reduced graft yield: one consequence positive and one negative. Since shorter hair has become popular, so has undetectable scarring. But a large subset of men wears their donor hair long enough to cover a well-executed strip, edges perfectly aligned, done with trichophytic closure, with a resultant narrow scar that has hair growing in it (preand post-op photos below; Dr. Wolf FUT patient). In this article, the Gargs find that a strip of 1.5cm or less in width is optimal. Most of my strips are 1cm and rarely up to 1.5cm in width. In Drs. Josephitis and Shapiro's article in this issue, their "safe width was determined by measuring donor laxity using a laxometer. Strip width ranged from 1-1.5cm." A common thread appears here: strip width of 1.5cm or less.



This does limit the number of grafts yielded. In the Garg article, a minimum of 2,500 grafts was harvested from a 1-1.5cm-wide strip, and in the Josephitis/Shapiro article, over 3,000 grafts would have be obtained if a full 1.5cmwide strip was excised. They "harvest as many grafts as possible while maintaining an easy closure." I take what the donor area will give me based on density and laxity, testing the closing tension and adjusting as necessary, and find a 1mm-wide strip yields at least 2,000 grafts. Since the advent of the FUT megasession, donor area scars have become wider as sessions have become larger. Wide, unsightly scars boosted the popularity of FUE as an alternative donor harvesting technique. If a strip is closed under little to no tension, pain after surgery can be controlled by non-narcotic pain relievers, especially after injection of a long-acting anesthetic at the end of the procedure. Less tension causes less pain and less scarring, which leads to happier patients. FUT remains a viable alternative when done properly. —BW

Tattoo Pigment Delivery with a Laser-Based Microjet Injector

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Conflict of Interest: The authors have worked with the manufacturer (AddoBio) to develop the GriMii instrument for use as a clinical tattoo device for scalp micropigmentation. The authors have a consulting relationship with the manufacturer.

We introduce a new needleless microjet injector that uses laser pulse energy to inject tattoo pigments for scalp micropigmentation (SMP) directly through the skin without a needle. It has the advantage of an almost painless experience, eliminating the need for anesthesia.

How a Traditional Cosmetic Tattoo Instrument Works

The traditional SMP that we use today employs a needle system, where three very small needles (manufactured as a single unit package in close proximity) are dipped in tattoo pigment (ink) cups (like the old quill pens of the 1700s).¹ Sometimes the tattoo pigment (inks) are placed in a well on the handpiece. The three needles reciprocate at 100-150 cycles per second relative to each other. The pigment is held by surface tension between the needles so there is no volume control over the pigment introduction. The needles are then inserted through the scalp. With a speed of 100-150 cycles per second, during a 0.25 second hold time through the epidermis, this three-needle tattoo system will make approximately 25-37 holes in the epidermis. The pigments adhere to the three needles through surface tension. A portion of the pigments "rub off" through the epidermal hole while some of the pigment is deposited into the upper dermis.

The process of moving pigments into the upper dermis once the needles are placed there is not an exact process. It depends upon many factors, such as 1) needle reciprocating speed; 2) the size of the needles; 3) the viscosity of the pigment, which dictates the surface properties of the pigments; and 4) the time the needles are left in the upper dermis. These needles create "holes," or tracts, in the epidermis that remain open one to three days before sealing. If the patient uses a shampoo before these holes seal, the detergent action of the shampoo can enter these holes and disperse the pigments in the upper dermis, changing the size, shape, and depth of the tattoo pigments. Therefore, shampooing or any alcohol-based product must be avoided for three days.

These multiple holes (or tracts) in the epidermis/dermal layer create several problems:

- 1. The pigments always leak out of the tracts or holes as they are created and after the process is complete.
- 2. The depth of the holes cannot be precisely controlled as it is dependent on the force applied by the operator, which is "felt" by the operator. It takes months or years for an operator to learn this process and not everyone can master the "feel" requirement for efficient operation of the three-needle system.
- 3. The duration that the needles are held in the skin is, at

best, an estimate and varies with the operator and the operator's reflexes and judgments.

- 4. The angle the needles are held in relation to the skin vary with skin toughness and operator preferences.
- 5. The operator controls the time the needles are left in the dermis based upon the "feel" that the needles broke through the epidermis and entered the dermis.

These factors play a significant role in making it very difficult 1) to control the precise volume of pigment introduced, 2) to control a precise depth of the skin/dermal layer penetrated, 3) to avoid leakage of the pigments out of the dermis after the process is complete, and 4) to avoid repeat patient encounters to adjust to #3 above.

With the traditional three-needle tattoo technology, the entire process is plagued by human variability. As such, the pigment left behind is an art form that is operator dependent.⁵ To control pain, SMP is most often performed, in our hands, using local and topical anesthesia. We find that the continuous needle penetrations cause considerable pain that is not tolerable in most patients. A ring block for the scalp has been our traditional approach to anesthesia.

The GriMii Instrument

This new device uses "an infrared laser beam of high energy (~3 J/pulse), which is focused inside a driving fluid in a small chamber. The pulse then induces various energy re-

leasing processes and generates fast microjets through a micronozzle. The elastic membrane of this system plays an important role in transferring mechanical pressure and protecting the pigment from heat release."2 Essentially, the laser instantly vaporizes distilled water (the bubble in Figure 1), which explodes to create a huge

FIGURE 1. Schematic of pigment (drug) delivery with a microjet injection using a beam splitter (modified and taken from Hun-jae Jang et al.³)



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instantaneous pressure gradient behind the membrane, thereby pressurizing the chamber behind the membrane. The pigment (ink or drug) sits on the other side of the membrane and the pigment is instantly propelled though the nozzle into the skin.

With proper instrument settings, controlled volumes of pigment can be released with each pulse. This device is likely to replace the standard cosmetic tattoo system that we have been using for SMP for the past 9 years, if not in its present iteration, then most likely in the next generation system as the handpiece gets smaller for more refined work.

Since the GriMii System can control the depth and "dot size," it produces an almost perfect visual "dot" in a single pass and places the pigment into the upper dermis at the correct depth. Dot size and depth can be controlled. There is no "hole" created in the epidermis; therefore, there is no leakage of the pigments out of the skin. This makes the first application the last application because the dots remain after the process is complete. The handpiece, at present, is cumbersome for detailed SMP work, but for those who want their hair to appear thicker (e.g., for the treatment of a depleted FUE donor area or for scars in the donor area), such detailed placement is unnecessary and the GriMii technology works well. We have used it successfully and the patients experienced minimal pain that was easily tolerated without anesthesia. Best of all, the training time is short and it is almost impossible to deliver the "dots" at an improper depth or at an improper size. Considering the problems (explained above) that have plagued SMP providers, without significant experience, this new technology offers a way to provide a high-quality service with less human variability.

DISCUSSION

The authors have held numerous 2-3 hour didactic courses teaching SMP at ISHRS meetings. We found the subtleties of the operation of the three-needle system has imposed significant quality control problems for those who have taken these courses when they applied what they learned to their patients. We have, however, successfully trained doctors and technicians from other doctors' offices after they have spent a week with us and gained more extensive hands-on experience. This new laser-based injector system solves the fundamental training and operational issues imposed by the three-needle system. It appears that the training time should be minimal.

SMP is becoming a rapidly growing service worldwide and is needed as more and more follicular unit excision (FUE)-depleted donor areas appear in the hair transplant patient population. SMP also has a role in supplementing hair transplants when the patient runs out of, or does not have enough, donor hair.⁶ It also has a significant role in the treatment of thinning hair in post-menopausal women (possibly present in 25% by age 49 years, 41% by 69 years, and > 50% have some element of FPHL by 79 years years of age⁷). This new technology should make it easier for professionals to learn to perform SMP safely without the difficulties described in the three-needle system used today. It also has the distinct advantage of not requiring anesthesia. The tattooing process does not require a medical license. It is not licensed in the United States at the Federal or State level, but it is licensed at the city or county level in most states. Different countries will have different rules for tattoo licenses, but an instrument such as described in this article, has the potential to appear in Spas and tattoo parlors around the world. We have discussed many of the problems associated with the tattoo industry in our 2015 publication³ and that is, therefore, not going to be discussed further here.

CONCLUSION

Our new tattoo technology for SMP offers the following: 1) avoids anesthesia, 2) is relatively painless, 3) is a one-step process, 4) is easy to learn, and 5) manages patients' fears of needles. The technology used in our practices is evolving as the authors gain more experience. The handpiece is awkward to hold, the nozzle heats up with continuous use and does not work well for fine, precise placement of the dots (e.g., a hairline). It works well, however, for patients with thinning hair, scalp scars, and overharvested donor areas as shown in Figures 2 through 7.

FIGURE 2. Before (*left*) showing some of the pigments deposited to the right side of the scar, and after (*right*)



FIGURE 3. Before (left) and after (right) SMP



FIGURE 4. GriMii handpiece in use



FIGURE 5: Before (top row) and after (bottom row) photographs of SMP in female with thinning corners.



FIGURE 6. A strip taken 3 days after SMP was performed with the traditional threeneedle system. The size of the dots can be estimated by comparing it with the length of the hair shafts A = 1/5th, B = 1/7th and C = 1/5th of a hair shaft, suggesting that the width and the length of the dots exceed 1mm in size. Note the variability of the dots with the traditional three-needle system. The operator successfully kept the pigment deposits restricted to the upper dermis thereby controlling the depth of penetration.



FIGURE 7. Histology of the pigments placed by the GriMii system. Note the pigment deposition in the upper reticular dermis. Skin biopsy shows multiple foci of pigment deposition (range: 0.05-0.3mm in diameter) within the papillary and superficial reticular dermis (on the left zoomed-in slide). There are also areas of pigment particle deposition along the fibrous root sheath and perifollicular stroma. The overlying epidermis demonstrates minimal disruption. The slide on the left is at 200× magnification and the slide on the right is at 100× magnification.



References

- Rassman, W., J. Pak, and J. Kim. In: Iam SM, ed. Scalp Micropigmentation: A Valuable Technique for Use in Hair Loss, 1st Edition. New Delhi: Jaypee Brothers Medical Publishers, 2014; p. 3.
- Han, T-H, J-M Hah, and J.J. Yoh. Drug injection into fat tissue with laser-based microjet injector. *Journal of Applied Physics*. 2011; 109:983105. http://doi.org/10.1063/1.3584813
- Jang, H-J., et al. Laser-induced microjet injection into preablated skin for more effective transdermal drug delivery. *Journal of Biomedical Optics*. 2014; 19(11):118002. https://doi.org/10.1117/1. JBO.19.11.118002
- Rassman, W., J. Pak, and J. Kim. Scalp micropigmentation, a concealer for hair and scalp deformities. *J Clin Aesthet Surg.* 2015; 8:35-42.
- 5. Rassman, W.R., J.P. Pak, and J. Kim. Scalp micropigmentation: a useful treatment for hair loss. *Facial Plast Surg Clin North Am.* 2013; 21:497-503.
- Rassman, W., J. Pak, and J. Kim. Combining follicular unit extraction and scalp micropigmentation for the cosmetic treatment of alopecias. *Journal of Plastic and Reconstructive Surg.* Global Open. 2017; 5. 1. 10.1097/GOX.00000000001420.
- 7. Birch, M.P., S.C. Lalla, and A.G. Messenger. Female pattern hair loss. *Clin Exp Dermatol.* 2002; 27:383-388. ■



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Hair Sciences

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Derivation of Hair-Inducing Cell from Human Pluripotent Stem Cells

The study reviewed in this month's Hair Sciences column is titled, "Derivation of Hair-Inducing Cell from Human Pluripotent Stem Cells." In their January 2015 publication in PLOS One,¹ Gnedeva and colleagues directed the development of human embryonic stem cells (hESC) to hair-inducing dermal papillae (DP) cells in culture. These hESC-derived DP cells (hESC-DP) were able to induce hair follicle formulation when transplanted under the skin of immunodeficient NUDE mice.

BACKGROUND KNOWLEDGE

The goal for cell-based treatment for hair loss is to duplicate and amplify human follicular units or human hair progenitor cells and then transplant these into areas of hair loss, thereby solving the problem of limited donor hair. It has long been known that DP cells are able to induce hair follicle formation both in embryogenesis and in the post-natal experimental setting. Mouse DP cells induced new hair follicle formation when transplanted in the normally hairless footpad of the adult rat.² Human DP cells derived from the scalp have been shown to induce hair follicle formation when transplanted into rodents.3 A barrier to cell-based therapy is that human DP cells lose their hair-inducing potential when one tries to extensively amplify them in cell culture. To overcome this barrier, the authors directed hESC to generate Neural Crest (NC) and then hair-inducing DP cells in culture. hESC have previously been shown to differentiate along multiple cellular fates, including the epidermal keratinocytes of the human hair follicle.⁴ However, the authors were the first to demonstrate the derivation of hESC into functional DP-like cells.

Key findings

- Human embryonic stem cells were used to derive DP cells in cell culture using NC cells as an intermediate. The authors used hESC to derive multipotent NC cells. A proportion of the hESC-NC cells differentiated to DP cells, which were isolated via passaging in cell culture.
- 2. The hESC-DP cells expressed the well-established DP markers Versican, Smooth Muscle Actin, and Alkaline Phosphatase.
- 3. hESC-DP cells were shown to induce hair follicle formation when transplanted into athymic nu/nu (nude) mice. The authors used the patch method of cell transplantation to demonstrate the hair-inducing potential of the cells of interest. The cells of interest were com-

bined with mouse epidermal keratinocytes and transplanted subcutaneously into nude mice. Newly formed hairs were able to be distinguished from pre-existing hairs using this method because nude mice have the albino background and transplanted hairs were mixed with dark haired mouse epidermal cells. Of note, cultured human DP (hDP) cells derived from adult scalp skin didn't induce hair follicle formation, consistent with known limitation of trans-species hair-inducing abilities of hDP cells. hDP cells have been shown to contribute to trans-species formation of single hairs but lacked a robust hair-inducing ability in a mouse model.

4. Bone morphogenetic protein (BMP) signaling is necessary but not sufficient for hESC-DP derivation. BMPs are growth factors that have been shown to be a mechanism in maintaining hair follicle inducing potential in mouse back skin.⁵ Also, BMPs are present in Fetal Bovine Serum, the culture medium used to induce hESC-DP cell differentiation from hESC-NC cell cultures. The BMP inhibitor dorsomorphin completely eliminates the hair-inducing abilities of hESC-DP cultures. However, the authors were not able to derive DP cells from hESC-NC cells using DP as the only differentiation mediator.

Collectively, the data presented in this publication showed that hESC-derived NC cells can be cultured to differentiate into DP cells that possess hair-inducing potential in a mouse model. The authors postulate that the hESC-derived DP cells have significantly more hair-inducing abilities than human DP cells since hESC-DP cells resemble a population of embryonic dermal papillae precursor cells, which have known hair-inducing activity. The authors also postulate that hESC-derived DP cells are a heterogeneous cell population that contain not only DP cells but also may contain melanocyte- and keratinocyte-forming cells.

The senior author in this 2015 study, Dr. Alexey Terskikh, from the Sanford-Burnham Institute, recently presented his new research at the annual meeting of the International Society for Stem Cell Research (ISSCR) in June 2019. His research showed that natural looking hair can be grown by using human-induced pluripotent stem cell (iPSCs)derived DP cells combined with mouse epithelial cells in a biodegradable scaffold. The scaffold controls the direction of the hair growth and helps the stem cells integrate into the skin. Despite this promising mouse data, there is a big scientific leap that needs to occur before this technology can be used in humans. First, these iPSC-derived DP cells need to be combined with human epithelial cells, a task that Dr. Terskikh is supposedly working on. Moreover, cellular implantation and follicular generation in humans with a functional immune system and complex follicular growth regulatory mechanisms is very different than follicular induction in immunodeficient mice. Dr. Terskikh co-founded the company Stemson Therapeutics with the goal of bringing his technology to humans. Time will tell if he will be successful.

References

- 1. Gnedeva, K., et al. Derivation of hair-inducing cell from human pluripotent stem cells. *PLoS One*. 2015 Jan 21; 10(1):e0116892.
- Jahoda, C.A., K.A. Horne, and R.F. Oliver. Induction of hair growth by implantation of cultured dermal papilla cells. *Nature*. 1984; 311:560-562.
- 3. Jahoda, C.A., et al. Trans-species hair growth induction by human hair follicle dermal papillae. *Exp Dermatol.* 2001; 10:229-237.
- 4. Metallo, C.M., et al. Retinoic acid and bone morphogenetic protein signaling synergize to efficiently direct epithelial differentiation of human embryonic stem cells. *Stem Cells.* 2008; 26:372-380.
- Rendl, M., L. Polak, E. Fuchs. BMP signaling in dermal papilla cells is required for their hair follicle inductive properties. *Genes Dev.* 2008; 22:543-557. ■





Medical and Professional Ethics

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Spotlight on Automation in Hair Restoration Surgery

Historically, all surgery was done with simple instruments held by the surgeon's fingers—a scalpel

gripped to cut through tissue, a punch rotated between the fingers to take a biopsy. But now, as in most other aspects of modern life, motorised technology has an established and evolving place in surgical practice. Advantages are multifold and can include increased speed, greater precision, lack of fatigue, access to difficult anatomical locations, potential cost efficiencies, and the possibility of remote operating

In the hair transplant surgery field, whilst technology has yet to make an impact on harvesting the scalp in the strip method of donor hair harvesting, there has been an explosion in recent years of motorised devices to replace the manual punch in harvesting FUE grafts. In the May/June 2019 issue of the *Forum* (Vol. 29, No. 3; pp. 98-106), the excellent article "A 2019 Guide to Currently Accepted FUE and Implanter Terminology" described some of the currently available motorised and robotic devices.

To discuss automation, first the semantics should be clarified. The *Compact Oxford Dictionary* provides the following definitions:

- Motorise equip a vehicle or device with a motor to operate or propel it
- Automatic operating by itself without human control [in this instance "operate" is intended to mean "function" rather than performing a surgical procedure!]
- Automation the use of automatic equipment
- Robot a machine capable of carrying out a complex series of actions automatically, especially one programmable by a computer

To date, the most well-known "robot" in surgery has been the da Vinci Surgical System, which is widely used by urology, gynaecology, and gastroenterology surgery teams; however, more recently, other systems such as the Versius have been developed. Both of these machines require the surgeon to continually control them, and therefore, should they actually be considered "robots" by the above definition? Or, rather, are they just motorised extensions of the human hand unable to function independently? This is in contrast to the ARTAS® device that, once initiated, can function independently of human control to make FUE and recipient site incisions, and more recently, implant grafts, so it can legitimately be called a robot.

The current ISHRS Position Statement on Qualifications for Scalp Surgery is as follows: "The position of the International Society of Hair Restoration Surgery is that any procedure involving a skin incision for the purpose of tissue removal from the scalp or body, or to prepare the scalp or



Reflective Question

Do I think that delegating to a machine to make FUE incisions is the same or different to delegating to a human being?

body to receive tissue (e.g., incising the FUE graft, excising the donor strip, creating recipient sites) by any means, including robotics, is a surgical procedure. Such procedures must be performed by a properly trained and licensed physician.* [*or in countries where it is allowed, a medically-licensed allied health professional practicing within the scope of his or her license.] Physicians who perform hair restoration surgery must possess the education, training, and current competency in the field of hair restoration surgery. It is beyond the scope of practice for non-licensed personnel to perform surgery. Surgery performed by non-licensed medical personnel may be considered practicing medicine without a license under applicable law. The Society supports the scope of practice of medicine as defined by a physician's state, country or local legally governing board of medicine." -Adopted by the Board of Governors, 11/15/2014

There is an ongoing debate that since the ISHRS does not allow delegation of surgery to a non-medically licensed person, why is it acceptable to delegate surgery to a robot? The argument is made that the procedure is not actually being performed by the physician but by the machine. The counter argument is made that the physician should be in control of the machine at all times and not delegate that control to a non-medically licensed person, therefore, the doctor is morally responsible and medico-legally accountable for the surgery done by the machine.

There are those who suggest that the follicular unit grafts produced by ARTAS might be inferior to those produced by other FUE techniques, that the transection rates can be higher, that the donor site holes are larger than those from the use of smaller punches, and that there can be a high missing graft rate. Whilst these statements might be correct in some circumstances, the ARTAS is just another tool, and it is the operator's skill and judgment that determine graft quality in each surgical case by making appropriate adjustments to the robot's parameters in the same way that some motorised devices have adjustable features. Similarly, different punches chosen by surgeons to use with any device will yield grafts of varying quality and donor scars of different sizes. If the surgeon feels that they have another tool within their armamentarium that will produce better grafts or does less donor site damage, then it is up to them to decide what is in their patient's best interest and be accountable for the results.

There are also those who think that if a non-medically licensed person is better at making FUE incisions (i.e., faster, lower transection rate, better quality grafts) than the ARTAS, then why does the ISHRS allow the latter but not the former? Just because someone is good at something does not mean it is morally right for them to do it. Veterinarians might be very good at doing heart surgery on animals but that does not give them license to operate on humans. The ARTAS is licensed for use in Canada, has Food and Drug Administration (FDA) 510(k) clearance in the USA, and has a CE Mark in Europe. ISHRS member ARTAS users should ensure it is legal to use the ARTAS model they have according to the regulations in their jurisdictions.

There are FUE harvesting machines advertised on the market that purport to be "robotic" when in fact they are just motorised devices, and the misleading messaging is intended to attract patients. Just as there will be doctors who produce consistently better hair transplant results than others, so there are devices that will produce better FUE grafts than others when used by a skilled operator. Ultimately, it should be the doctor who decides which tools to use to get the best results. One only knows what one knows, and that is why ongoing education is vital in our field. This can be gained from regular reading of published hair transplant surgery articles and books, attending ISHRS meetings and live surgery workshops, attending regional hair restoration surgery society meetings, and visiting other doctors to observe their surgical techniques. If a physician sticks to a single method and does not keep up with advancements in our field, then they are unlikely to continue to offer their patients cutting-edge treatment getting the best results.

The ARTAS was launched in 2011 and since then subsequent versions of the software have sought to become more sophisticated and user friendly. Further improvements are likely. If artificial intelligence (AI) is the simulation of human intelligence processes by machines including learning (the acquisition of information and rules for using the information), reasoning (using rules to reach approximate or definite conclusions) and self-correction, then can the ARTAS be considered to have AI since, when making FUE incisions, it does correct the depth of incision based on the previous experience (i.e., it self-corrects)?

Who knows—might the time come when an AI system could independently assess feasibility for hair transplantation based on a visually assisted computerised analysis of the donor-to-recipient ratio? However, it is unlikely that any AI system will be able to determine actual suitability for a hair transplant given the complexity of factors that need to be considered to make this decision including the assessment of scalp health.

The FUE method of harvesting donor hair has unfortunately led to the practice of non-medically licensed persons performing surgery. These individuals have not received medical training and do not have the required knowledge and surgical skills to serve the patients' best interests. The availability of the ARTAS robot takes this one step further as some doctors inappropriately allow it to be operated by unlicensed persons with no surgical skill at all.

ISHRS members should take a strong stance against anybody other than a doctor* being in control of a robot at any time.





Hair's the Question

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*The questions presented by the author are not taken from the ABHRS item pool and accordingly will not be found on the ABHRS Certifying Examination.

Emina Vance's presentation at the St. Louis Workshop inspired me to take a closer look at site making and graft placement. There are so many potential errors that can affect a patient's results,

and they all happen independent of the graft harvesting option chosen (i.e., FUE or linear). The surgeon is the best quality control in the office, so test your skills at spotting these errors and improve your patient results in the process! Many thanks to Emina for her assistance with creating this column.

Site and Graft Placement Errors

- 1. In the photo, these grafts are:
 - A. Too small for the site and should be moved to a site that matches the size of the graft
- B. Placed too high in the site
- C. Placed too low in the site
- D. Placed at the right depth in the site
- This photo demonstrates the 2. consequences of:
 - A. Grafts placed too shallowly in the sites causing poor growth
 - B. Grafts that are too thick
 - C. Grafts that are too thin
 - D. Grafts placed too deep in the recipient sites
- 3. In the photo, which of the following would be a likely consequence of this single graft placement error?
 - A. Pitting and possible pimple-like inclusion cvst
 - B. Ridging at the hairline needing multiple surgeries
 - C. Pimple-like inclusion cyst and possibly another graft will be placed on top (piggybacking)
 - D. Poor growth. You will have to repeat the surgery.



- 4. In the above photos, the site/graft placement error (marked with a line in the photo on the right) is most likely caused by:
 - A. Surgeon error
 - B. Inattentive graft placement staff working too fast
 - C. Sharp implanter use
 - D. Too small of a graft for too large of a site (Site to Graft mismatch)
- 5. The error in this photo is most likely caused by:
 - A. Surgeon error
 - B. Inattentive graft placement staff working too fast



- C. Sharp implanter use
- D. Too small of a graft for too large of a site (Site to Graft mismatch)
- 6. The error in the previous photo can be remedied best by:

 - A. Careful training of graft placement staff
 - B. Making sure the graft size and site size are matched
 - C. Trimming grafts
 - Using only single hair grafts D.





- 7. Why is the pattern of recipient sites/graft placement (marked in the photo on the right) less than optimal?
 - A. Curly hair does not place well into sites that are in lines.
 - B. Density and naturalness are optimized with staggered placement.
 - C. Regrowth is slower.
 - D. Only one graft placement staff member at a time can work in the area.
- 8. Which likely error caused the irregular hair growth in this photo?
 - A. Sites created in the wrong direction
 - B. Scarring in the recipient area
 - C. Grafts placed too deep causing inclusion cysts (ingrown hairs) during regrowth
 - D. Grafts gripped too high with forceps when placed causing kinking of the graft and irregular growth

- What is the likely error in this photo?
 A Sites were pot
 - A. Sites were not made in the correct or consistent direction.
 - B. Staff accidentally used sharp implanters rather than dull implanters.



- C. Hair was too kinky/curly for transplantation.
- D. Patient shaved his head before the procedure.
- 10. What is the graft placement error at this patient's hairline?
 - A. Single-hair follicular unit grafts placed too densely at the hairline
 - B. Multi-hair follicular unit grafts placed at the hairline
 - C. Close spacing of the follicular units at the hairline



D. Incorrect direction of follicular units at the hairline

> ANSWERS ON PAGE 198



Answers

Too high graft shown next to graft that is actually on the surface



1. **B.** Poor growth can result if this is not remedied. Since grafts typically range in length from 2-6mm, creating sites at the proper depth to match the grafts is as essential as matching the size of the site (chubby or skinny) to the size of the graft (Site to Graft matching, which helps prevent grafts pulling out

completely as in the left oval in the picture). If you have never before done this in your practice, it might seem tedious and daunting to add this task to your routine. But in reality, this task integrates seamlessly with a little practice and the results for your patients improve.

- 2. **D.** Much like sites placed too shallowly, there are aesthetic consequences to grafts placed too deeply (especially non-single FUs). During healing, this may also manifest as a pimple-like inclusion cyst (ingrown hair). One of the main problems is that this never looks natural for the patient, so every effort should be made to look for deep grafts and avoid creating the problem in the first place.
- A. While A is the correct answer, there is a high risk 3. of answer C—another graft being placed on top—if your staff is not vigilant. One graft placed on the top of another is known as "piggybacking." When grafts are placed too deeply, there is a risk for the site to appear empty and thus the risk of another graft being placed on top of the first. To quote Emina, "If piggybacking occurs, the top graft grows normally and the bottom graft grows inside the scalp causing an ingrown hair. I have seen this in the past. When the ingrown hair is extracted, both grafts come out and are wasted." This question assumes that not every graft is placed too deep. If this problem happened systemically in all areas of the transplant, poor growth might result. Ridging is caused by scarring from multiple surgeries.

Graft placed too deep showing piggybacking



4. A. Sites should be made by the surgeon in all cases, so if there is a straight line on the frontal hairline, it is the surgeon's error. Straight hairlines do not occur in nature and are a dead giveaway that a poor hair transplant has occurred. Of course, the other clues in this picture are the wide gap between the lateral hump and the grafts, not to mention the FUE extraction sites well outside of the safe zone. But if these were not present, you could spot it by the straight line of grafts at the most obvious and visible edge.

5. **B.** Unless the surgeon is placing his/her own grafts, it is likely a team error. Since grafts have about a 6-8 hour out-of-body time before their survival starts to decline, quick graft placement is a priority. However, when teams move TOO fast, or when grafts are splayed, this error may result. Not only does this waste a graft, it is entirely preventable with a few simple Operating Room protocols. Graft to Site mismatch (choice D) can cause thinner grafts to easily pull out of the site, in which case you would find a WHOLE graft out on the surface (see

the photo in answer #1). Choice C, sharp implanters (or even dull ones), may PREVENT this error if properly used, even with a



radically splayed graft as occurs in African hair types.
A! Implanters undoubtedly have revolutionized the implantation of splayed grafts, and as long as the grafts are properly inserted into the implanter of choice, this result is much less likely. Splayed hairs or uneven bulbs could be challenging to insert into the implanter, though. Proper insertion means that there is no hair shaft/bulb sticking out as shown in the photo.

If your team still prefers forceps, Emina suggests that "hairs that are splayed should be grasped with forceps all together and inserted into a site. Grafts that have uneven bulbs should be placed by grasping and inserting the longest hairs first, then tucking in the shorter hairs before completely inserting the rest of the graft."

Improper graft insertion into the implanter (*left photo*); placing splayed graft/uneven bulbs with forceps (*center/right photos*).



7. B. Staggered placement of grafts will optimize the appearance of density. Linear placement of grafts not only gives the patient the appearance of less density, it also looks unnatural. When creating





recipient sites, they should be interlocked so that the space between the sites is always hidden by another site (as opposed to rows of sites and rows of empty spaces between the sites).

HAIR TRANSPLANT FORUM INTERNATIONAL

Incorrect *(left)* and correct *(right)* holding of graft with forceps



8. **D.** This is illustrated in Emina's photos below. This also might be caused by a graft incompletely inserted into an implanter causing hidden kinking or hooking on placement that can only be discovered if you remove the graft to check. Scars in the recipient area can also cause a "wave" to the hair as it grows out, but without the

irregularity or "frizz" noted here. This effect CAN abate with time and can also be a sign of early growth.

9. A. If this grows out, it never looks natural and is impossible to style. Laser hair removal can help, as the variability in FUE extraction can be tricky (but not impossible). By the way, whoever it is online who keeps



telling patients that the only way to get the highest density is to shave their head for the transplantation procedure needs to stop spreading misinformation. We all know that this is not true and it only encourages distrust in our entire profession. 10. **B.** These are multi-haired follicular units at a hairline, and they are an obvious sign of a graft placement error that will never look natural for the placement and likely should be removed. Hairline grafts should always be single-hair follicular units, but not all single-hair grafts are the same as the photos below demonstrate. To quote Emina, "The photo on the right shows contrasting grafts with coarser and finer hair and the grafts on the left contain one terminal and one transected/telogen hair. When selecting grafts for the first line of hairs (whether it is in hairline, temples, or eyebrows), the single-hair grafts should be clean and truly containing a single hair. Telogen hairs will transition into anagen, and some transected hairs will grow depending on the level of their transection. In the case presented here, the unnatural result most likely occurred from either placing two-hair grafts or accidentally placing grafts that had one terminal and one transected or telogen hair."



Bibliography

- Vance, E. Graft Management: Critical Thinking During Graft Preparation & Placement, St. Louis 360 Hands-On Cadaver Workshop, St. Louis, Missouri, USA; 3-5 August, 2018.
- Kinky new hair growth photo in Question #8 from https://medium. com/@artemiscreates/i-got-a-hair-transplant-heres-what-it-waslike-with-photos-59cd0b38e01. ■

Awareness Campaign on the Unlicensed Practice of Medicine

It has not been easy coming up with a campaign idea, slogan, and brand that is uniformly accepted across all countries. Nonetheless, after months of strategizing with the agency we contracted, we feel we have a slogan and campaign name that will spread the message universally.

INSPIRATION

We are excited to announce the campaign's mission statement and name based on the

- directives we were given: be "bold and aggressive" and do "not be too soft or nice."
- facts that these illicit, global clinics are causing "threats" to patient health and outcomes.
- ISHRS's desire to educate people about these illicit clinics more as a Public Service Announcement than a typical marketing campaign for a product or service.

MISSION STATEMENT

Educate on the hair transplant industry's best practices + warn of clinics where doctors do not perform surgeries, yet market themselves as legitimate.

CAMPAIGN NAME

We focused on calls-to-action to rally everyone in the ISHRS (regardless of whether you believe the campaign's promos should be "positive" or "negative" in nature). After considering many, we chose "fight" as this is what we are doing: fighting against the illicit clinics.

We then developed a memorable acronym to address these horrific procedures, where "Fight" = Fraudulent, Illicit + Grave Hair Transplants. We chose not to use "ISHRS" in the campaign's name as it is also an ISHRS priority that other groups have the opportunity to promote the campaign, and we believe that there is little to no chance for that to happen if "ISHRS" is present in the campaign name.

Accordingly, we are excited to announce the campaign name: Fight the FIGHT with the acronym:

"Fight The Fraudulent, Illicit + Grave Hair Transplants."

We will no longer be using Beware Hair Transplant Black Market or the hashtag #BewareHTBlackMarket. The new hashtag will be #FightTheFIGHT.

VIDEO AND IMAGERY IN PRODUCTION

Our fight has begun! We are actively building content associated with multiple, approved concepts that will allow us to Fight The Fraudulent, Illicit + Grave Hair Transplants! Let's: "Fight The FIGHT!

- "The Launch" Event
 - o Emotions to elicit: Anticipation + Excitement
 - Summary: A tease where Social Influencers and ISHRS Doctors simultaneously share the same copy, #s, content, etc., on their social channels (date and time TBD)

- "Is It Worth the Risks?"
 - Emotions to elicit: Uneasiness + Worry about the online ads that "hook" patients to choose cheap, illicit clinics
 - o Summary: Point out that potential, negative consequences are possible if a patient doesn't deeply research a clinic, and these consequences can ultimately outweigh what some see as the potential rewards associated with these clinics
- "Choose Wisely"
 - o Emotions to elicit: Trust (in the ISHRS) + Alarm (towards choosing an illicit clinic in a Medical Tourism market)
 - Summary: Position the ISHRS as a champion to patients who are researching hair loss solutions, while patients are educated on elements that they must be leery of
- "Do You Know Who's Operating On You?"
 - o Emotions to elicit: Nervousness + Anger towards illicit clinics
 - Summary: How illicit clinics prioritize profits over patient health + quality results, by potentially using unsupervised, non-Doctors to perform surgeries
- "Did Your Doctor Take The Pledge?"
 - o Emotions to elicit: Interest + Trust with the ISHRS
 - o Summary: ISHRS Doctors pledge to prioritize patient health, quality results, and medical ethics over profit unlike illicit clinics

WHAT YOU CAN DO TO SUPPORT THE CAMPAIGN

- We are planning a direct-to-patient and friends communication to inform them of the campaign and branding on October 1, 2019. It is intended to be a coordinated email blast of all members sending this letter out to their email client lists and or social media lists.
- Please Join the ISHRS Annual Giving Fund and help in our Fight the FIGHT campaign with a donation! It is crucial that we have member support. Please make a donation to help support the battle against the unlicensed practice of medicine. To donate to the Fight the FIGHT campaign, go to:

https://ishrs.org/make-a-donation/

• Follow and share ISHRS Social Channels:

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Literature Review



Aditya K. Gupta, MD, PhD, FISHRS | London, Ontario, Canada | agupta@execulink.com

Use of Finasteride and Sexual Dysfunction

Hagberg, K.W., et al. Risk of erectile dysfunction associated with use of $5-\alpha$ reductase inhibitors for benign prostatic

hyperplasia or alopecia: population based studies using the Clinical Practice Research Datalink. *BMJ*. 2016; 354:i4823.

Finasteride is a 5 α -reductase inhibitor available in two doses. A 5mg dosage is indicated for treatment of benign prostatic hyperplasia (BPH) while a 1mg dosage is indicated for treatment of androgenetic alopecia (AGA). The issue with finasteride is that it has become a somewhat controversial drug; despite being described as safe in clinical trials, it has become associated with serious adverse events including fatigue, muscle weakness, cognitive issues, and most notoriously, sexual dysfunction.

In this study, the UK Clinical Practice Research Datalink was used to analyze a population of 71,849 using finasteride 5mg for BPH therapy and 12,346 using finasteride 1mg for AGA therapy for risk of erectile dysfunction related to treatment. The study revealed that neither dosage significantly increased the risk of erectile dysfunction but that longer duration of BPH did. The study also comments that prescribing guidelines suggest α (alpha) blockers as the front line treatment with a switch to/addition of finasteride as the disease progresses. Thus, the authors suggest that it may be prescribing guidelines that are responsible for the onset of symptoms correlating with finasteride use versus finasteride as a direct cause.

Comment: The importance of this study is twofold. First, it provides evidence that confirms the reports of initial trials and clinical observations that finasteride does not significantly increase erectile dysfunction at either dose. Second, it suggests a cause for significantly increased erectile dysfunction in the finasteride-using patient group. Thus, the study has effectively provided a scenario where increased erectile dysfunction could be observed in finasteride users without being directly linked to the medication itself. The erectile dysfunction may be associated with the duration of BPH. As finasteride is one of only two FDA-approved drugs indicated for AGA, this study is important for the continued effective treatment of AGA.

The Biological Importance of Hair

Tanaka, H. Length of hair affects P1 and N170 latencies for perception of women's faces. *Perceptual and Motor Skills*. 2018; 125(6):1011-1028.

This study investigated whether there is a difference in neural activity when a person sees virtual female faces with long, medium length, or short hair. Hair lengths that were 1) to the shoulders, 2) to the mouth, and 3) to the ears were deemed long, medium length, and short, respectively. Neural activity was quantified using electroencephalography (EEG)—the technology that translates the brain's natural electrical activity, such as event-related potentials (ERPs), to interpretable graphs. Immediately after the sighting of the faces with the different hair lengths, there was a difference in the P1 and N170 components of participants' ERP, which corresponded to them paying more attention to (i.e., staring longer at) faces with long hair compared to short hair.

Comment: This study makes a case for the fact that the anecdotal preference for long hair (especially on females) may not just be rooted in vanity since the scientific evidence supports that longer hair catches more attention than shorter hair. For neurobiological reasons, it is only natural to engage in behaviors that makes one's hair long—or appear long. This provides further reassurance to patients that their feelings about hair loss are valid and that treatments need not be considered luxuries.

Growing Hair Ex Vivo

Abaci, H. E., et al. Tissue engineering of human hair follicles using a biomimetic developmental approach. *Nature Communications.* 2018; 9(1):5301.

Many attempts to grow hair *ex vivo* have been rendered futile because, unbeknownst to previous researchers, three-dimensional (3D) factors are essential for hair growth. The authors developed a technology whereby human hair follicles could be cultured using 3D plastic molds; the growing matrices for the hair follicles were fibroblast-containing collagen gels. These molds contained manufactured channels onto which cells of the dermal papilla were seeded. These channels were rich in keratinocytes to better mimic the environment of skin. Use of a skin-like environment was successful in growing hair *ex vivo*.

Comment: Tissue engineering introduces bold and exciting possibilities in the treatment of innumerable physical deficits. The hair follicle contributes to the natural appearance of skin as well as acts as a stem cell niche contributing to pigmentation and healing. The prospect of having access to a limitless supply of donor follicles is exciting and will also have application in plastic reconstruction. We eagerly await the further development of this technology.



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A to Z Surgical



Letter to the Editors

Re: "Finasteride for anderogenetic alopecia is not associated with sexual dysfunction: a survey-based, single-centre, controlled study."

RahulKrishna S. Kota, MD | Guntur, Andhra Pradesh, India | krahulkrishna@gmail.com

Venkataram Mysore, MD, FISHRS | Bengaluru, Karnataka, India | mnvenkataram@gmail.com

We have read with great interest the article titled, "Finasteride for androgenetic alopecia is not associated with sexual dysfunction: a survey-based, single-centre, controlled study."¹

Oral finasteride is one of the two U.S. FDA (United States Food and Drug Administration) approved drugs available for the treatment of androgenetic alopecia.² But, many patients are apprehensive about taking oral finasteride owing to its sexual side effects. This article has shed light on the safety profile as far as the sexual side effects are concerned and this article will be of value in counselling such patients.

However, there are several limitations in the study that we would like to point out:

- 1. In this study, in the test group, the authors have included patients on finasteride (with varying duration from 0-5 years), but haven't mentioned the dosage of finasteride they were taking. Since the cumulative dosage of the drug plays an important role in causation of the side effects, this is an important omission.
- 2. The control population in the study was not well defined. It was stated that "the control group consisted of finasteride non-users," but there was no mention about them having androgenetic alopecia or any other comorbidities. Sexual dysfunction has previously been linked to both depression and negative body image³ often seen in patients of androgenetic alopecia, particularly young men.⁴ In a recent study, an increased risk of sexual dysfunction and psychosocial impairment (attributed to body image changes due to hair loss) was observed in men 18-40 years of age with moderate to severe AGA.⁴ It has also been pointed out that an

increased risk of sexual dysfunction may be inherent in alopecia-diagnosed men due to modified conversion of testosterone to dihydrotestosterone observed in these patients.⁵ In view of the above factors, the control population should specify the types of patients included in the controlled group.

- 3. The number of control population (n=99) when compared to the test group (n=663) is very small and hence leads to difficulty in the comparison between the two groups.
- 4. In the study, the ASEX (Arizona Sexual Experience Scale) scores were compared between the test and control groups and found that for all durations of finasteride use, ASEX score on average for the finasteride group was less than that of no-finasteride group. However, it was not mentioned whether the ASEX scores are also related to the duration of finasteride use.

We feel that these issues need to be addressed and welcome the opinion of the authors.

References

- Haber, R.S., et al. Finasteride for androgenetic alopecia is not associated with sexual dysfunction: a survey-based, single-centre, controlled study. *Hair Transplant Forum Int'l.* 2019; 29(1):93-96.
- Mella, J.M, et al. Efficacy and safety of finsateride therapy for androgenetic alopecia: a systematic review. *Arch Dermatol.* 2010; 146:1141-1150.
- 3. Sanchez, D.T., and A.K. Kiefer. Body concerns in and out of the bedroom: implications for sexual pleasure and problems. *Arch Sex Behav.* 2007; 36:808-820.
- 4. Molina-Leyva, A., et al. Psychosocial impairment as a possible cause of sexual dysfunction among young men with mild androgenetic alopecia: a cross-sectional crowd sourcing web-based study. *ActaDermatovenerol Croat.* 2016; 24:42-48.
- Mondaini, N., et al. Finasteride 5mg and sexual side effects: how many of these are related to a nocebo phenomenon? *J Sex Med*. 2007; 4:1708-1712. ■

REPLY: Robert S. Haber, MD, FISHRS

I appreciate the careful reading and identification of potential limitations of our study by Drs. Kota and Mysore. They correctly note that the specific dose of finasteride (e.g., 1 or 5mg) was not identified for this study. The purpose of the study was to determine if exposure to ANY dose of finasteride was associated with a greater risk of sexual dysfunction when compared to a control group, thus the exact dose was not felt to be critical, and would have required additional stratification and more complex statistical analysis. In the event that an association was discovered, at that point additional research involving daily and cumulative dosing would have been important.

They also note that the control group was not well defined. This was intentional in order to avoid any possible selection bias. Every adult male patient being seen in the clinic for any reason was asked to complete a questionnaire. Those men not using finasteride constituted the control group. As we were not studying co-morbidities with AGA, we did not gather that data, although it would have been interesting to have that data.

I fully agree that the control group was small. The size was determined to be sufficient to generate meaningful statistical conclusions, however, in the current international multicenter follow-up study, we will ensure a larger control group to address this shortcoming.

I was unable to understand the last point that "it was not mentioned whether the ASEX scores are also related to the duration of finasteride use." However, in the sentence before that, they summarize the data showing that "ASEX score on average for finasteride group was less than that of no-finasteride group."

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Message from the ISHRS 2019 World Congress Program Chair

Robin Unger, MD | New York, New York, USA | drrobinunger@yahoo.com

As summer ends in the northern hemisphere and fall approaches, we know the tomatoes need to be canned, kids' school schedules set—and, of course,

organization finalized for the ISHRS World Congress in Bangkok!

Members responded enthusiastically for the call for abstracts, and speakers have been carefully selected to create a program that addresses a wide range of subjects in hair restoration. An exceptionally balanced program has been created for the Triple Crown. The general sessions will cover all methods of donor excision with time allowed for lively discussion. Techniques of SMP in all its variety will be discussed, including a new method never before presented.

And, of course, regenerative medicine as applied to hair restoration will be discussed in depth by some of the most respected individuals in the field.

Don't forget to book your accommodations and consider your travel plans for before and/or after the Congress to see beautiful Thailand!



Message from the ISHRS 2019 World Live Surgery Workshop Chair

Kapil Dua, MBBS, MS, FISHRS | New Delhi, India | drkapildua@akclinics.com

Dear All,

The Triple Crown workshop is round the corner and I can't wait for it to get here. Most of the

program is well set now. We have more than 50 faculty members who will be sharing their cumulative experience of more than 500 years with all of us on Wednesday, Saturday and Sunday.

On 13th November, Wednesday, we will have a didactic WLSW Pre Course. It will consist of the lectures related to all the techniques of hair restoration—FUT, FUE, and scalp micropigmentation (SMP). So, please mark your programs accordingly so that you do not miss the preliminary program.

On Saturday afternoon, lectures will cover the latest

developments in the art and science of the SMP procedure. These will be followed by a hands-on demonstration in SMP. You'll also have the opportunity to get a feel of all the available devices for FUE and to discuss the finer points with the masters of FUT.

On Sunday, we will get an opportunity to see FUE + FUT; FUT; FUE scalp; FUE excisions from body; long hair FUE, and live SMP for the first time at an ISHRS LSW. There will also be simultaneous demonstrations of implantation with all of the available techniques in the five Operating Rooms.

It is going to be a power-packed program in state-of-theart operating rooms set up in the vibrant city of Bangkok. Looking forward to catching up with you!

Experience Bangkok



Meeting Reviews

Review of the 10th Annual Serbian Diaspora Medical Conference June 20-22 • Belgrade, Serbia

Jeffrey S. Epstein, MD, FISHRS | Miami, Florida, USA | jse@drjeffreyepstein.com

It is not often that part of being on the faculty of a scientific meeting includes dinner at a Royal Palace. However, that is exactly the kind of special attention five ISHRS members received as part of participating in the 10th annual Serbian Diaspora Medical Conference, held in Belgrade, Serbia, which was attended by around 180 international physicians and

over 200 Serbian physicians. Put together by Dr. Gorana Kuka Epstein, it provided an exciting experience.

Dr. Gorana Kuka Epstein, who was the moderator and organizer of the hair section of the meeting, spoke on adipose transfer techniques and the investigation of cell therapies in the treatment of androgenic and scarring alopecias. Dr. Nilofer Farjo presented a thorough review of medical therapies, comparing efficacies and

indications for use. Emina Vance lectured on eyebrow transplantation techniques, emphasizing how to achieve natural appearing results. Dr. Bessam Farjo presented his group's work on a hair "banking" project and cultured dermal papilla therapy, in which he has been involved for the past several years, discussing its potential application for rejuvenating miniaturized hairs. Finally, Dr. Jeffrey Epstein reviewed the







newest procedures in the treatment of hair loss, including follicular unit excision (FUE) techniques, hairline lowering surgery, and the applications of body hair to scalp hair restoration.

As with many smaller meetings, the social aspect was one of the highlights, and this one was likely not surpassed by that experi-

enced at most meetings. Her Royal Highness Princess Katarina and His Royal Highness Prince Alexander hosted us at the Royal Palace for a gracious evening that included dinner and entertainment by a Serbian dancing troupe and the country's top opera singer. After dinner, we were treated to a tour of the Palace, including the lower-level entertainment area that during communist rule served as a movie theatre

> to President Tito. Past guests here ranged from Sophia Lauren to Prince Juan Carlos of Spain and many other members of European royalty.

Another nice aspect of the meeting was that it was very exciting to have hair be included with mainstream medical subjects—a sign of just how important our specialty is becoming.

Review of the 11th Annual Hair Transplant 360 Workshop August 2-4, 2019 • St. Louis, Missouri, USA

Sharon Keene, MD, FISHRS | Tucson, Arizona, USA | drkeene@hairrestore.com

The 11th annual St Louis University (SLU) hands-on cadaver workshop, aptly titled Hair Transplant 360, took place on the campus of this historic university. Course director Sam Lam organized a CME curriculum to provide attendees with an extensive, intensive didactic and operative learning participants, along with 20 faculty for both courses. Attendees represented 27 states and 13 countries including Australia, Austria, Brazil, Canada, China, Egypt, El Salvador, Guatemala, India, Malaysia, Mexico, Spain, and the UK. Live video links allowed attendees an excellent view of surgical

experience on hair restoration surgery indications and techniques. The workshop



techniques performed in Guatemala by Dr. Maria Schambach (long hair FUE) and all the way

showcased both methods of donor harvesting: the linear ellipse also known as follicular unit transplantation (FUT) and follicular unit excision (FUE) with micro-punch excision of follicular units. Graft placement techniques were also reviewed, including the latest implanter techniques. Lectures covered overall planning, hairline design, and organization and time management for both FUE and FUT techniques. Attendees were also schooled in dermatological conditions that cause hair loss but that should not be considered for surgery. Didactic lectures in the morning were followed by the hands-on cadaver lab in the afternoon, where attendees received one-on-one supervision by faculty and were able to apply what they had learned earlier that day, facilitating the learning experience.

Simultaneously, Emina Vance directed the assistants course to train the physician assistants who were in attendance. This year there were 78 physicians and 29 assistants from Brazil, Dr. Mauro Speranzini illustrated his use of dull implanters to rapidly and atraumatically place grafts.

While the days started early and ended late, attendees were treated to a delicious breakfast to start each day, and were complimentary of all they were able to learn during the hands on intensive program. Meanwhile, faculty was rewarded at the conclusion of each day with a wonderful dinner and fantastic company making this a rewarding educational experience and enjoyable social occasion all around!

This meeting provides even seasoned hair restoration doctors the opportunity to learn from their peers and train new staff. So, mark your calendars now for next year's SLU cadaver workshop, which is scheduled for July 24-25, 2020.

We got rave reviews as usual. Thank you to all who attended for contributing so much! ■

2019/2020 Meetings Calendar

Please follow this link to a listing of upcoming HRS meetings: https://ishrs.org/upcoming-events/

2019/2020 ISHRS directly sponsored/supported meetings:

November 13-17, 2019

27th World Congress & World Live Surgery Workshop of the ISHRS Bangkok, Thailand For more information: www.27thannual.org

March 19-22, 2020

Cowgirl Hair Loss Workshop An ISHRS Regional Workshop International Society of Hair Restoration Surgery *Houston, Texas, USA* For more information: www.CowgirlHairLoss.com

June 10-14, 2020

EURO 2020 Athens: European World Live Surgery Workshop International Society of Hair Restoration Surgery *Athens, Greece* For more information: www.ishrs.org



July 24-25, 2020

Hair Transplant 360 Cadaver Workshop & FUE Hands-on Workshop In collaboration with the International Society of Hair Restoration Surgery *St. Louis, Missouri, USA* http://pa.slu.edu For more information: pa@slu.edu

October 21-24, 2020

28th World Congress of the ISHRS Westin Playa Bonita *Panama City, Panama* For more information: www.28thannual.org



The ISHRS is the leader in high-quality education for hair restoration surgeons. The ISHRS has achieved the highest level of accreditation to organize education for physicians from the renowned Accreditation Council for Continuing Medical Education.



Save the date!

International Society of Hair Restoration Surgery European World Live Surgery Workshop

June 10-14, 2020





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Calendar of Hair Restoration Surgery Events

http://www.ishrs.org/content/upcoming-events

DATES	EVENT/VENUE	SPONSORING ORGANIZATION(S)	CONTACT INFORMATION
* NOV 13-17, 2019 NOV 13-16, Congress	27th World Congress of the ISHRS & World Live Surgery Workshop: Triple Crown Bangkok Thailand	International Society of Hair Restoration Surgery www.27thannual.org	www.27thannual.org
NOV 16-17, WLSW			
MAR 19-22, 2020	ISHRS Regional Workshop: Cowgirl Hair Loss Workshop—Art & Perfection, Female Hair Loss <i>Houston, Texas, USA</i>	International Society of Hair Restoration Surgery Hosted by Carlos J. Puig, DO, FISHRS	cpuig@hairdoctexas.com
* JUN 10-14, 2020	ISHRS Euro 2020: European World Live Surgery Workshop <i>Athens, Greece</i>	International Society of Hair Restoration Surgery	www.ishrs.org
* JUL 24-25, 2020	12th Annual Hair Transplant 360 Cadaver Workshop & FUE Hands-On Workshop	Saint Louis University School of Medicine, Practical Anatomy & Surgical Education	pa@slu.edu
	St. Louis, Missouri, USA	In collaboration with the International Society of Hair Restoration Surgery	
		http://pa.slu.edu	
* OCT 21-24, 2020	28th World Congress of the ISHRS Westin Playa Bonita Panama City, Panama	International Society of Hair Restoration Surgery www.28thannual.org	www.28thannual.org

* 2019/2020 meetings that qualify for the ISHRS member educational maintenance requirement

REMINDER

ISHRS full **Members** and **Fellow Members** are required to attend 1 ISHRS-approved meeting every 3 years to maintain their member category.

ISHRS WORLD CONGRESS SCHEDULE

27TH WORLD CONGRESS

November 13-17, 2019 Bangkok I Thailand

28TH WORLD CONGRESS

October 21-25, 2020 Panama City I Panama 29TH WORLD CONGRESS

October 20-23, 2021 Lisbon I Portugal

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Global Council of Hair Restoration Surgery Societies

Membership proudly includes: American Board of Hair Restoration Surgery American Society of Hair Restoration Surgery Arab Association of Hair Transplantation Argentine Society of Hair Recovery Asian Association of Hair Restoration Surgeons Association of Hair Restoration Surgeons-India Australasian Society of Hair Restoration Surgery Brazilian Society of Hair Restoration Surgery British Association of Hair Restoration Surgery China Association of Hair Restoration Surgery French Society of Hair Restoration Surgery German Society of Hair Restoration Hair Restoration Society of Pakistan Hellenic Academy of Hair Restoration Surgery Ibero Latin American Society of Hair Transplantation International Society of Hair Restoration Surgery Italian Society for Hair Science and Restoration Japanese Society of Clinical Hair Restoration Korean Society of Hair Restoration Surgery Paraguayan Society of Hair Restoration Surgery Polish Society of Hair Restoration Surgery Swiss Society for Hair Restoration Surgery Thai Society of Hair Restoration Surgeons



Editorial Guidelines for Submission and Acceptance of Articles for the *Forum* Publication

- 1. 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.
- 3. Articles submitted with the sole purpose of promotion or marketing will not be accepted.
- 4. Authors should acknowledge all funding sources that supported their work as well as any relevant corporate affiliation.
- 5. Trademarked names should not be used to refer to devices or techniques, when possible.
- 6. 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.
- 7. Once the manuscript is accepted, it will be published as soon as possible, depending on space availability.
- 8. All manuscripts should be submitted to forumeditors@ishrs.org.
- A completed Author Authorization and Release form—sent as a Word document (not a fax)—must accompany your submission. The form can be obtained in the Members Only section of the Society website at www.ishrs.org.
- 10. 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).
- 11. Images should be sized no larger than 6 inches in width and should be named using the author's last name and figure number (e.g., TrueFigure1).
- 12. Please include a contact email address to be published with your article.

Submission deadlines: October 5 for November/December 2019 issue December 5 for January/February 2020 issue February 5 for March/April 2020 issue April 5 for May/June 2020 issue

> Please note submission address: forumeditors@ishrs.org

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To place a Classified Ad in the *Forum*, email cduckler@ishrs.org. In your email, include the text of what you'd like your ad to read. You should include specifics in the ad, such as what you offer, the qualities you're looking for, and how to respond to you.

Classified Ads cost \$100 per insertion for up to 75 words. You will be invoiced for each issue in which your ad runs. The *Forum* Advertising Rate Card can be found at the following link:

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NOV 13-16 27TH WORLD CONGRESS







WORLD LIVE SURGERY WORKSHOP NOV 16-17

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GENERAL OUTLINE

TUESDAY November 12, 2019	Ancillary Meeting: ABHRS Exams
WEDNESDAY November 13, 2019	Pre-Congress Courses: I Basics Course I Advanced/Board Review I Surgical Assistants Program I Half-Day Course
THURSDAY November 14, 2019	I General Session I Live Patient Viewing I Welcome Reception
FRIDAY November 15, 2019	I Discussion Table Topics I General Session I Workshops I M&M Conference
SATURDAY November 16, 2019	 General Session until noon World Congress ends at noon WLSW: Triple Crown begins (SMP) at the hotel when the World Congress ends Gala! in the evening
SUNDAY November 17, 2019	WLSW: Triple Crown hospital all day

World Congress Chair Robin Unger, MD WLSW Triple Crown Chair Kapil Dua, MBBS, MS, FISHRS WLSW FUE Co-Chair Ken L. Williams, Jr., DO, FISHRS WLSW FUT Co-Chair I Damkerng Pathomvanich, MD, FISHRS WLSW SMP Co-Chair I Timothy P. Carman, MD, FISHRS

FEATURED GUEST SPEAKERS

Allogeneic Hair Transplantation: **Current Status**

You likely get the following question asked by your patients..."My friend/ brother/cousin has so much hair! Can't you take some of his and transplant it to me?" Is it possible to transplant

hair from one person to another? It has been tried in the past, but success would require harsh immunosuppressive drugs and for this reason, was not a logical treatment. Dr. Kwon has been conducting research on mice and will share with us new, exciting developments. Could this be the future of the field of hair restoration surgery?

Ohsang Kwon, MD

Department of Dermatology, Seoul National University College of Medicine Seoul, Korea

Optimizing Hair Health

What we apply to our hair and scalps matters. The value of the global hair care market amounted to nearly 100 billion U.S. dollars in 2017. You can imagine that there are hundreds of thousands of invalidated marketing claims. What is the

truth about certain products? Which ones really work? What should we recommend to our patients - or for that matter, to use on ourselves and to recommend for our family and friends - to optimize our hair health? Learn from an accomplished hair research scientist and have the opportunity to ask vour questions!

Thomas L. Dawson, Jr., PhD Agency for Science, Technology, and Research (A*STAR) Institute for Medical Biology, Singapore



Platelet-Rich Plasma for the Treatment of Androgenetic Alopecia

We are all familiar with the tried and true topical minoxidil and oral finasteride. But what about oral minoxidil? Is it an effective medication for AGA? Based on the research trials thus far. what is the appropriate dosing, what are the

side effects? The popularity of injecting PRP to treat hair

loss has been growing exponentially. There are many protocols and no set treatment standard. Many doctors report positive results. What do we know about PRP for AGA? What is the theory about why it should work? DOES it work? What are the concentrations, intervals, and protocols that doctors are using?

Ramon Grimalt, MD

Department of Dermatology, Universitat Internacional de Catalunya, Barcelona, Spain

Adipose Derived Stem Cells: Where Are They From and What Are They Doing for the Hair Follicle?

We have been hearing a lot about injecting fat as an adjunctive therapy for hair loss and to improve HRS outcomes. What is the rationale? What are the different types of adipose tissue and what is the clinician aiming to do? What does the research say?

Gillian Westgate, PhD Centre for Skin Sciences

University of Bradford, United Kingdom

Ergonomics and Prevention of Injuries when Performing Hair Restoration Surgery

The delicate microsurger and repetitive nature of techniques performed during hair restoration surgery has always lent to concerns of neck and back strains and thus, proper ergonomics



during surgery, for both the surgeon and the technicians. With the popularity of FUE, there are additional concerns as so many hours per day are involved with focus on a small surgical field. Learn and practice from an Applied & Clinical Physiologist about proper posture during surgery and possible ergonomic aids to minimize strain, as well as what exercises and stretching should be incorporated to maintain musculoskeletal balance and health

Janet L. Nelson, MS, ACSM Manhattan Applied Physiology, New York, USA



The ISHRS is the leader in high quality education for hair restoration ACCREDITED WITH COMMENDATION Surgeons. The ISHRS has achieved the highest level of accreditation to organize education for physicians from the renowned Accreditation Council for Continuing Medical Education.

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HAIR TRANSPLANT FORUM INTERNATIONAL

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