FOLLICULAR UNIT
HAIR TRANSPLANTATION

An Overview
...our method is the safest and most foolproof in the business — we simply tattoo your face on your scalp, and teach you to walk with your head down.
The desire for increased naturalness led to “Follicular Unit Transplantation”
FOLLICULAR UNIT’S
FOLLICULAR UNIT TRANSPLANTATION

Graft Type
1-3(4) Hair Fu’s

Session Size
1000-2500 Follicular Units

Graft Density
20-30 Fu’s / square cm
FOLLICULAR UNIT TRANSPLANTATION

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Session Size
1000-2500 Follicular Units

Graft Density
20-30 Fu’s / square cm
FOLLCULAR UNIT GRAFTS

Follicular Units are smaller than minigrafts with the same number of hairs.
HIGHEST DEGREE & CONSISTENCY OF NATURALNESS

Can Be Undetectable Under Close examination
NATURAL AFTER EACH SESSION

- No *Grafty* Phase..... *Not Obligated* to Come Back

- Saves Hair For Other Areas
THE “DENSITY” ISSUE

AS THE GRAFTS BECAME SMALLER.......  

THE POTENTIAL FOR POOR DENSITY INCREASED
HOW MANY GRAFTS ARE NEEDED?

- 80-100 Fu/Cm² = Normal Density
- <40-50 Fu/ Cm² = early thinning = see through in specific situations
- < 20-25 Fu/ Cm² = Late thinning = see through all the time
- One session of Fu’s = 20 to 30 Fu/CM²
- Most patients need at least 2 sessions in an area to get to 40-50 Fu/Cm²
NUMBER OF GRAFTS

FRONT HALF

~100 sq/cm’s
2500 Fu’s
25 Fu’s per Sq/Cm
NUMBER OF GRAFTS

FRONT THIRD

~60 sq/cm’s

1500 Fu’s

25Fu’s per Sq/Cm
DENSITY WITH 3 SESSIONS OF FOLLICULAR UNITS

Total of 4500 Fu in ~ 100 Sq cm = 45 FU/Sq cm
DONOR HARVESTING
&
GRAFT PREPARATION

Single Strip and Microscopic “Slivering” Technique
DONOR STRIP IS REMOVED IN A SINGLE STRIP

[Limits transection at this step]
DONOR STRIP IS CUT INTO “THIN SLIVERS” WITH A MICROSCOPE

[Limits transection at this step]---Critical Step

“Slivering”
“THIN SLIVERS” ARE CUT INTO INDIVIDUAL FOLLICULAR UNITS

“Thin Sliver”

1-3 Hair Follicular Units
RECIPIENT INCISION
MICRO SLITS ARE USED INSTEAD OF PUNCHES
GRAFT SIZE IS MATCHED TO BLADE SIZE

1 Hair FUs
15 degree sharpoint

2 Hair FUs
22.5 degree sharpoint

3 Hair FUs
30 degree sharpoint

1 Hair FUs

2 Hair FUs

3 Hair FUs

3-4 Hair Double FU's

69 Beaver
INCISIONS ARE CREATED PAYING ATTENTION TO DIRECTION, ANGLE, AND DEPTH.
SELECTIVE DISTRIBUTION
GRAFTS ARE SEPARATED FOR “SELECTIVE DISTRIBUTION”
FOLLICULAR “PAIRING”
PLACING

• Critical Step

• High Potential for Trauma at this Step
GENTLE PLACING TECHNIQUE
“BUDDY” PLACING TECHNIQUE
"STICK AND PLACE"
TECHNIQUE
THE HAIRLINE
CREATING A NORMAL HAIRLINE

- Irregular Anterior Border
- Variable Density
- Density (Definition) Begins Posterior
- Soft Temporal-Lateral Angle
CREATING A NORMAL HAIRLINE

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CREATING A NORMAL HAIRLINE
CREATING A NORMAL HAIRLINE

My Hairline (Hopefully Normal)

Transplanted Hairline
CREATING A NORMAL HAIRLINE

• Follicular Units do not automatically produce a normal hairline

• Pattern and Distribution Are Still Important
CLINICAL RESULTS
SHAPIRO PATIENT

3 SESSIONS OF ~1500 GRAFTS

Before

Close-up

After
SHAPIRO PATIENT

3 SESSIONS OF ~ 1500 GRAFTS

Before

After

Close-up
LOWERING MALE HAIRLINES AND CREATING WIDOWS PEAKS
EARLY HAIRLINE WORK

Delicate Work
LOWERING MALE HAIRLINE AND RECREATING NEW TEMPORAL POINT

Before Surgery

After Surgery
REBUILDING TEMPORAL POINTS

Delicate Work

Before Repair

After Repair

2 Session of on each side
Repair of 3rd Degree Burn

Before Repair

After Repair
LOWERING FEMALE HAIRLINE
RECREATING SIDEBURNS

Delicate Work
MAJOR REPAIR

Delicate Work
CREATING A NATURAL HAIRLINE IN ONE SESSION USING A SYSTEMATIC APPROACH AND MODERN PRINCIPLES OF HAIRLINE DESIGN

PART 1 - MODERN PRINCIPLES OF HAIRLINE DESIGN

INTRODUCTION

Creating a natural hairline is one of the most important elements of a successful hair transplant. The ability to create an undetectable hairline has dramatically increased in recent years due to the development of more refined techniques and a better understanding of the principles of naturalness. Many of us promise undetectable hairlines in our marketing materials and literature. As a result, the “degree” of naturalness demanded by patients has also dramatically increased. Today, patients expect an undetectable hairline that can stand on its own after one session. They will no longer tolerate an embarrassing grafty phase. This high “degree” of naturalness can be achieved using the techniques and the principles described below.

DISCUSSION

• Conceptualize a larger total hairline area that includes both a “transition zone” and a “defined zone” (Figure’s 1 & 2)

Most discussions about hairlines focus only on the most anterior border of the hairline, commonly referred to as the “transition zone”. In contrast, I conceptualize the hairline as a larger area bridging the bald forehead to the area of central density. This larger area is made up of two smaller zones: The anterior portion (“transition zone”) and the posterior portion (“defined zone”). The transition zone should be soft and irregular and the defined zone should be more defined and dense. Both these zones are important to the overall appearance of the hairline.

The “Transition Zone”

The transition zone consists of the first .5-1 cm of the hairline. It should initially appear irregular and ill defined but gradually take on more definition and substance as it reaches the defined zone. The most common advice given about creating the transition zone has been to “make sure that the anterior border of this zone is irregular and does not follow a straight line”. This is correct but the following additional principles are also important to keep in mind when attempting to recreate a natural transition zone:

➢ It is important to vary the density along the transition zone. Close observations of normal hairlines reveals that “intermittent” areas of higher density contributes a great deal to the appearance of irregularity.
➢ Only 1 hair follicular units should be used in the anterior portion of this zone with a shift to 2 hair follicular units toward the posterior portion of this zone.
➢ One hair follicular units can vary in thickness. Having your assistants specifically search for and separate out about 50 of the finest 1 hair grafts for use in the most anterior portion of this zone adds your ability to produce naturalness.
➢ There is a natural tendency to “fill in the spaces” in the transition zone. This impulse must be overcome to prevent the creation of too straight or solid appearing hairline.
➢ It is also important to adjust the width of the transition zone based on the severity of hair loss. The greater the degree of hair loss the wider and more diffuse this “transition zone” should be, mimicking the pattern found when more severe hair loss occurs in nature.

The “Defined Zone”

The “defined zone” is the two to three cm wide area that sits directly behind the “transition zone”. In this area the hairline should develop a higher degree of definition and density, yet still have the highest degree of naturalness under close examination. Concentrating 2-3 hair follicular units this area accomplishes both goals nicely. Density in the defined zone contributes to the illusion of a fuller looking hairline by limiting the distance that can be seen past the transition zone. It does this, however, without placing hair directly in the transition zone thereby limiting the chance of creating too straight or solid an appearance.
• **Use “Follicular Unit” Micrografts Trimmed of Excess Epithelium** (Figure 3)
  
  Most physicians will say that micro grafts should be used in the hairline area. However this statement is not specific enough since all ‘micro grafts’ are not the same. Follicular units used in the hairline area should be trimmed of excess surface epithelium. This does not mean creating “skinny” or “stripped” follicular units. This means creating a “tear drop” shaped follicular unit that has minimal surface epithelium, but still has a little tissue around the sebaceous gland and root. Follicular units created this way are smaller than untrimmed follicular units and this small size enables them to be placed closer together in tinier, less traumatic incisions. Additionally, the minimal amount of epithelium left on follicular unit’s limits the potential for pitting, which can still occur when untrimmed micro grafts are placed too deep.

• **Use “Selective Distribution”**. (Figure 4)
  
  Separating and selectively placing 1, 2, and 3 hair follicular units allows us precise control over the distribution of hair density. There are some techniques of creating micro grafts (such as the Mangabout graft cutter) that do not allow for the separation of different size grafts. When these techniques are used 1, 2, and 3 hair micro grafts are lumped together and we lose the benefit of “selective distribution”.
  
  The anterior portion of the transition zone should contain only 1 hair follicular units with a shift to 2 hair follicular units toward the posterior aspect of this zone. Larger 2-3 hair follicular units should be placed in the defined zone, concentrating more 3 hair follicular units in the mid central portion of this zone (the “frontal tuft” area). Creating density in this “frontal tuft” area has a high aesthetic impact, contributing to a greater illusion of density overall and mimicking a pattern commonly found in nature.

• **“Follicular Pairing”** (Figure 5)
  
  Sometimes more 1 hair follicular units are created than necessary. It is more desirable to have a greater number of 2-3 follicular units in the defined zone and frontal tuft areas. At these times a technique called “follicular pairing” can be used. This is the process where a two hair graft can be artificially created by combining two 1 hair grafts (or a three hair graft can be created by combining a 1 and 2 hair graft). The minimal extra tissue and small size of follicular units allows for the process of follicular pairing.

• **Use “Enough” Follicular Unit Micrografts in the First Session to Ensure Naturalness and Substance** (Figure 6) (Table 1)
  
  Sufficient numbers of follicular units should be placed in the hairline area during the first session to ensure that it will be natural and have enough substance to stand on its own independent of further sessions. I feel that in order to accomplish this, one needs to place a minimum of 20-25 fu/sq/cm. Remember I refer to the hairline area as the combination of the “transition” and “defined” zones. This area can range from 20–30 square cm. If you do the math this calculates to a minimum of 400-750 follicular units that need to be placed in the hairline area during the first session.

  Many combination mini-micrografters I observe use only 100 – 300 follicular units in the hairline before switching to minigrafts more posterior. In my opinion it is not the use of minigrafts posterior to the hairline area, but the use of too few follicular units within the hairline that limits the degree of naturalness created with this method in one sessions. A slight increase in the size of the hairline area and the number of follicular units would overcome this limitation.

  This number of follicular units (400-750) is based on a very conservative degree of dense packing (20-25 fu/sq/cm) and one that I think most physicians have accepted as safe. Higher degrees of dense packing (30-40 fu/sq/cm) may be possible in skilled hands but are more controversial and not necessary. I feel the temptation to place grafts at very high degrees of dense packing should be resisted in the hairline except under certain circumstances. Otherwise the hairline could become denser than the central region and give an abnormal ring like effect when viewed from above. In nature the hairline area is typically less dense than the central region.

• **Proper Placement of The Anterior Border of the Hairline** (Diagram 7)
  
  One of the most important principles of hairline placement is “Don’t place the hairline too low.”

  Common guidelines for locating the anterior border of the hairline include:
  - 4 finger breaths above the glabella
  - 8-10 cm above the glabella
  - The point where the horizontal plane of the scalp meets the vertical plane of the face.

  These rules for determining hairline placement are only guidelines and have to be individualized depending on the size of the head and degree of baldness. In patients with more severe degrees of hair loss raising the hairline by as much as 1-2 cm may be appropriate. Sometimes a properly constructed “widows peak” can be used to create the illusion of a slightly lower hairline without actually lowering the hairline inappropriately.

• **Proper Placement of Lateral Border of the Hairline and The Frontal-Temporal Angle** (Figure’s 8 & 9)
All normal male hairlines have a frontal-temporal angle which is formed by the junction of the frontal and temporal hairlines. The frontal hairline is the superior border of this angle and the temporal hairline is the inferior border. The apex of this angle moves posterior as the frontal and temporal hairlines thin and recede. Properly positioning this point and recreating a soft frontal temporal angle is one of the more difficult aspects of hairline recreation. Blunting this angle or placing it too low will cause an unnatural look.

Some of the common rules for estimating where the frontal hairline should meet the temporal hairline are:

- Drawing a line from the lateral epicanthi of the eye back toward a point where it meets the remaining temporal hair.
- Making sure the hairline created by this point does not slope downward toward the ear but looks parallel or slopes upward when viewed from the side.

In mild to moderate hair loss where there is only a little loss of the temporal hair these rules work well. The existing temporal hair usually becomes the inferior border of the angle while the “future” anterior hairline will become the superior border of the angle. The apex of the angle lies along the line that was drawn from the lateral epicanthi of the eye.

In more severe degrees of hair loss where the temporal hair has receded and the lateral fringe has dropped, finding this point can be more difficult. There is no temporal hair with which the lateral epicanthal line can intersect. Visualizing and recreating this “lateral hump” restores the temporal hair and gives the lateral epicanthal line a target to intersect. They usually meet near the top of the hump or about 1 cm in front of a vertical line drawn from the auditory meatus. The lateral hump usually becomes the inferior border of the frontal-temporal angle.

- **Adjusting the Hairline Downward** (Figure 9, 10, & 12)
  Once you have drawn your hairline using conservative guidelines your patient may want to adjust it downward. Creating a small widows peak is a relatively safe way to give the illusion of a lower hairline with out using many grafts. Some patients may ask you to fill in the temporal recessions and move the lateral aspect of the hairline down. You have to be careful about filling in or blunting the normal frontal-temporal angle. I find one way for me to lower this area in a relatively safe manner is to visualize the current angle and imagine sliding it slightly forward.

- **Proper Direction and Angle**
  It is also important to pay attention to the change in direction and elevation (or angle) of grafts positioned around the frontal-temporal angle. The hair along the frontal hairline is usually pointed forward and leaves the scalp at about a 30° angle. The hair along the temporal hairline is pointed more posterior toward the ear and leaves the scalp at an acute angle (almost flat or 10 degrees). As one moves around the temporal-lateral angle there should be:
    - a gradual transition in direction from pointing forward to pointing down and posterior.
    - a simultaneous gradual change in angle from 30 degrees to flat
  Many times there are residual telogen hairs that can act as guides for finding this transition.

**CONCLUSION**

The principles and techniques outlined in this paper will help the physician meet the expectations of today’s patients. We can now establish a natural hairline during the first surgery that can stand on its own independent of further sessions. It is not enough to “just use micrografts”. Proper selection and use of follicular units, combined with artistry and skill, provide us with the tools to follow natures lead in creating naturally appearing soft hairlines, while establishing the illusion of density. In my opinion the problem with some combination mini micro grafters is not that they use minigrafts behind the hairline. The problem is that they do not take full advantage of the power of follicular units by using enough of them within a slightly expanded hairline.
CREATING A NATURAL HAIRLINE IN ONE SESSION USING A SYSTEMATIC APPROACH AND MODERN PRINCIPLES OF HAIRLINE DESIGN

PART 2 - A SYSTEMATIC APPROACH  (Creating a framework and then fine tuning)

INTRODUCTION

The following is a step by step systematic approach that I have found useful when creating my hairlines. It is not meant to be dogmatic or followed to a tee. I know there are other methods that work just as well. This approach helps me consistently and systematically build an initial framework of a hairline that I can later fine tune.

METHOD

• Find and mark the anterior border of the hairline using the principles described in Part 1. (Figure 7)

• Find and mark the frontal temporal angle using the principles described in Part 1 (Figure 8 & 9)

• Draw the Hairlines Zones (Transition Zone, Defined Zone, and Frontal Tuft) (Figure 10)

• Make initial critical “marking incisions” along the anterior border of the transition zone. (Figure 11) & (Figure 12)

  These incisions should be about 1 cm apart and slightly irregular. Placing some in front and some behind the line helps create the irregularity. These “marking incisions” ensure you will not lose the position of the hairline if the ink comes off and allows you to safely move to “defined” zone.

• Make initial critical marking incisions at the frontal temporal angle. (Figure 11 & 12)

• Look for exiting hairs on both sides of this incision to help you determine the change in direction of the incisions as you move around this angle. Make some marking incisions along side these hairs.

• Once the marking incisions are made start the “defined zone” first before doing any work in the “transition” zone (Figure 11& 12)

• This is one of the key things that helps me not get into trouble with too straight a hairline. By starting the defined zone first and then moving up into the transition zone in an organized manner I feel I have more control. Incisions in “defined” zone are placed in a staggered pattern about and placed at about 25 fu’s / sq/ / cm creating organized disorder. When small grafts are placed this close together the eye does not recognize this as a pattern. I feel this is preferable to random placement, which can lead to skipped areas and uneven distribution of density.

• Create an initial framework for the transition zone (Figure 13) and (Figure 14)  

  After the “defined zone” has been established the following technique is used to methodically create a framework for the “transition zone”. Incisions are made that connect the “marking incisions” to the defined zone. This creates a framework resembling multiple triangular like bridges connecting the transition zone to the defined zone. The tips of these triangular like areas are the original “marking incisions” that were made on the anterior border of the “transition zone”. The shape of each bridge resembles an elongated triangle and contains about 6-10 incisions. The base of these triangles extends into the “defined zone”. When this is finished a framework has been created for an irregular pattern in the transition zone. These triangular areas will later become the areas of increased intermittent density that helps make the transition zone look irregular

• Make multiple passes keeping the basic framework and ratio of density  

  After creating this framework artistic skills are used for fine-tuning. Several more passes are made through this “transition zone” filling in obvious spaces but keeping the same general pattern and being careful not to get rid of the irregularity. We try to create more incisions within the triangles than between the triangles. This creates the intermittent areas of higher density within the transition zone that contributes so much to irregularity and naturalness.

• Place grafts using the principles of selective placing and follicular pairing. (Figure 4 & 5)

  This helps insure a natural density gradient.
• Final “Stick and Place” Fine Tuning
   About 100-300 grafts are usually saved for the end of the procedure to further fine-tune the hairline. Look at the hairline and “stick and place” these extra grafts at points where they are needed. One hair grafts are put in the transition zone if needed. If the transition zone is satisfactory then the one hair grafts are paired to create 2 hair grafts and placed in the defined zone. Once again it is best to concentrate more grafts in the frontal tuft region because density in this region is crucial to an aesthetically pleasing affect.

CONCLUSION
Using the principles of hair line design and as systematic approach one can consistently create a natural hairline in one session. The idea is to create an initial framework based on the principles of hairline design and then use artistic ability and experience to fine tune this framework.
LIMITING TRANSECTION AND DONOR WASTE WITH THE MICROSCOPE AND SINGLE STRIP

DEFINITION OF DONOR WASTE

- Donor waste is the loss of available hair follicles that occurs during the donor harvesting and graft cutting phases of a hair transplant. It is different from graft trauma and low yield. It occurs due to discarding hairs in the cutting process. It is the hair that is left on the table.

Example: A virgin 10 cm square area of donor area has 2000 hairs available before donor harvesting and graft cutting. The amount of hair in the grafts produced from this area after waste can be as low as 1500 hairs if there is 25% wastage during cutting.

THERE IS INTRINSICALLY A HIGHER POTENTIAL FOR DONOR WASTE WHEN PREPARING LARGE NUMBERS OF FOLLICULAR UNITS

- Intrinsically, the extensive trimming necessary to produce good quality follicular units increases this risk of waste. Hairs that were partially transected during the harvesting process can be injured or discarded during the final trimming process. When producing a large number of follicular units, it is essential to eliminate the transection that occurs during the donor harvesting phase.

- With small minigrafts “cut to size” less cuts are made and therefore logically there are less chances of transecting hairs. Also since these grafts are “cut to size” partially transected hairs are often left in as part of the graft. The viability and contribution of these partially transected hairs is debatable but they are not discarded.

COMPARING TECHNIQUES

MULTIBLADED KNIFE TECHNIQUE WITHOUT THE MICROSCOPE

- The most vulnerable area for waste with the multibladed knife technique is in the initial strip removal. This is a blind cut. ‘Hard” tumescence, magnification, and meticulous technique in following the angle of hair growth has decreased the transection that occurs at this step. Some physicians become very skilled at this technique and can get near perfect strips much of the time. 

BUT even the best at this technique have at least a 10% waste and cannot do it every time. Less skilled physicians can have a transection rate as high as 30 percent.

SINGLE STRIP (ELIPSE) TECHNIQUE WITHOUT THE MICROSCOPE

- The initial harvesting with this technique produces much less transection because only 2 cuts are being made and because it is easier to adjust the angle on both cuts.

- The most vulnerable area of transection with this technique is when the assistants cut the ellipse into thin slivers. These are blind cuts and the degree of transection depend on the skill of your assistants rather than the physician and is probably similar to the degree of transection in the multibladed knife technique.

- Once the donor has been dissected down to thin strips they are easily dissected with high power magnification and back lighting.

THE MICROSCOPE AND SINGLE STRIP TECHNIQUE …THE LEAST WASTE

- As above, the initial harvesting with this technique produces much less transection because only 2 cuts are being made and because it is easier to adjust the angle on both cuts.

- Cutting the single strip (ellipse) into thin slivers is done under direct visualization and it is possible with the microscope to get near 0% transection at this step. I recommend Dr Seegers tape on this for excellent instruction.

- Once the tissue has been dissected down to thin slivers they can be cut into the various grafts either with the microscope or the backlight and magnification loops. There is no true advantage to the microscope at this stage over a back light and high magnification.

ONE REASON THAT PHYSICIAN DON’T SWITCH OVER TO THE MICROSCOPE IS THAT IT IS DIFFICULT TO GET THERE ASSISTANTS TO SWITCH. IT IS POSSIBLE TO MAKE THE TRANSITION BY STARTING WITH ONLY ONE MICROSCOPE AND ONE ASSISTANT THAT SPECIALIZES IN “SLIVERING”. IF THIS ASSISTANT CREATES ALL THE SLIVERS THE REST OF THE WORK CAN BE DONE UNDER BACKLIGHT AND LOOP MAGNIFICATION WITH LITTLE LOSS.
COMPARING DIFFERENT GRAFT PREPARATION TECHNIQUES

MULTIBLADED KNIFE WITHOUT THE MICROSCOPE

**BLINDLY REMOVE MULTIPLE STRIPS WITH**

ASSISTANTS CUTS THIN STRIPS INTO EQUAL 1CM SECTIONS

1 CM PIECES ARE CUT INTO 3-4(5) HAIR MINIGRAFTS

1 CM PIECES ARE CUT INTO 1-3 HAIR FOLLICULAR UNITS

SINGLE STRIP WITHOUT THE MICROSCOPE

REMOVE SINGLE STRIP WITH 1 OR 2 BLADES

ASSISTANTS CUT SINGLE STRIP BLINDLY

1 CM PIECES ARE CUT INTO 3-4(5) HAIR MINIGRAFTS

1 CM PIECES ARE CUT INTO 1-3 HAIR FOLLICULAR UNITS

SINGLE STRIP WITH THE MICROSCOPE

REMOVE SINGLE STRIP WITH 1 OR 2 BLADES

ASSISTANTS "CUT TO SIZE" INTO THIN SLIVERS WITH MICROSCOPE

1 CM PIECES ARE CUT INTO 3-4(5) HAIR MINIGRAFTS

1 CM PIECES ARE CUT INTO 1-3 HAIR FOLLICULAR UNITS

YELLOW AREAS ARE AREAS OF TRANSECTION OR WASTE
FOLLICULAR UNIT GRAFTING KEY POINTS FOR SUCCESS

THE GOAL IN HAIR TRANPLANTATION

- To redistribute a limited amount of donor hair, with as little waste as possible, to a potentially expanding bald or thinning recipient area. To do this so the patient will be happy now and in the future. Patient happiness is dependent on meeting the patient’s expectations of naturalness, density, and amount of work needed.

MEETING EXPECTATIONS OF NATURALNESS

- The expected degree of naturalness has increased as techniques and results have improved
- Patients want to look natural after one session
- Patients want an undetectable exposed hairline
- Patients want a pattern and distribution that can stand on its own now and as future hair loss occurs

MEETING EXPECTATIONS OF DENSITY ("Appearance of Fullness" “Illusion of Density”)

- Meeting density expectations can be more difficult than meeting naturalness expectations.
- The amount of hair available from the donor area is limited and less than the amount of hair that originally existed in the recipient area
  - Therefore we can never re-create the true hair for hair density (hair/unit area) that existed before hair loss started.
  - Fortunately the “Illusion of Density” or Appearance of Fullness” can be created with much less than the original amount of hair. It is said that one can lose 50% of the volume of hair before the hair begins to look thin. My experience is that 25-35 fu’s per sq cm give a thin look and 40-50 fu per sq cm gives an illusion of density.
  - The achievable illusion of density varies significantly from patient to patient. It is determined by many factors including current hair loss, future hair loss, hair thickness, hair curl, and hair color.
  - Realistic expectations are crucial for a patient to be content with achievable density. During the consult, it is the responsibility of the physician to educate the patient in this area.
  - Patient education in terms of number of FU’s/ Sq Cm instead of numbers of grafts is extremely helpful in this area.

MEETING EXPECTATIONS OF COST AND NUMBER OF PROCEDURES

- Even if the patients expectations of naturalness and density are met………The patient will still be unhappy if the number of procedures and cost to arrive at this result is much greater than expected

KEY FACTORS FOR SUCCESSFUL FOLLICULAR UNIT GRAFTING AND SMALL GRAFT MEGASESSION

- Select good patients and avoid risky patients.
- Educate patients…..especially about density
  - A 1000-2000 graft follicular unit megasession moves about 2500-4500 hairs
  - The average patient requires 3000-8000 hairs in the frontal area to be happy with the appearance of fullness in the front
  - This range is dependent on hair characteristics and patient expectations.
  - This means that even with large sessions, more than one sessions may be required in the front for the patient that desires a fuller look.
  - The main advantage of megasessions is not quicker density……It is a high degree of naturalness after one session.
- Limit the session size to your skill level. An experienced physician can place 1000 –2000 follicular units in the frontal area with consistent good yield if proper technique is used.
- The grafts used in the frontal area and crown should be follicular units.
- For the central area either “follicular units” or 3-4(5) hair small minigrafts “cut to size “ can be used
- Become skilled at Donor Harvesting and Graft Preparation techniques that limit waste of precious donor hair.
  - This means using a single strip and the Stereoscopic Microscope when preparing large numbers of follicular units
  - Using the multibladed knife with hard tumescence, magnification and backlighting is an acceptable technique when the majority of grafts are small minigrafts “cut to size”. But this technique produces too much waste when using large numbers of follicular units.
  - Use microslits when doing large numbers of follicular units I feel this limits the potential for damage to existing hair and the blood supply
- Understand the importance of graft sizing.
  - The size and shape of the graft should match the size and shape of the incision to maximize yield and naturalness
- Follow a pattern of incisions and distribution of various size grafts that mimics the normal distribution of hair.
  - An irregular hairline zone that is not too dense or straight (only 1-2 hair follicular unit grafts)
  - Understand the importance of central density and concentrate the greatest amount of hair in the central area by selectively placing larger numbers of larger grafts in this area. (3 hair follicular units or 3-4(5) hair small minigrafts “cut to size”)
- Become skilled in proper placing techniques that minimize trauma and maximize yield and naturalness
- IN MY OPINION THE PROBLEM WITH COMBONAITON GRAFTING IS NOT THAT LARGER GRAFTS ARE USED IN THE CENTRAL AREA BUT THAT NOT ENOUGH FOLLICUALR UNITS ARE USED IN THE FRONTAL AREA.
“FOLLICULAR UNITS”

VS

SMALL MINIGRAFTS “CUT TO SIZE”

Most physicians agree that only 1-2 hair grafts should be used in the hairline and frontal area. There is active debate over the type of graft that should be used in the central area. Proponents of larger grafts say that density cannot be produced with small grafts like follicular units. Proponents of follicular units say that density is a function of the amount of hair not the type of graft.

Density is a function of amount of hair not type of graft. If enough follicular units are used they can achieve density. It is just harder to do and takes more work. I believe that follicular units are the best grafts to do in the hairline area and frontal third (which I break up into the transition zone and defined zone). It is important to be able to produce maximum naturalness and density in this zone at the same time and to be able to do it in a single session. The 2-4 hair follicular units are particularly useful in the what I call the defined zone, which is the area immediately behind the transition zone. 2-4 hair follicular units are smaller than 2-4 hair minigrafts cut to size and thus can be placed closer together in a single session.

Larger grafts such as linearly shaped small minigrafts “cut to size” may have a place in the central area in certain situations when naturalness in a single session is not as critical. It is especially useful for physicians that do not have the resources to do large number of follicular units.

FOLLICULAR UNITS

• **Description**
  - When preparing “follcular unit”, natural groupings of 1-3(4) hairs are isolated and trimmed of as much epithelium and extra tissue as safely possible. This may mean leaving the sebaceous unit intact.

• **Advantages**
  - Follicular unit grafts are smaller than untrimmed grafts with equivalent amount of hair. Because of there small size these grafts can be placed closer together in smaller recipient sites.
  - Because they have less epithelium their potential for pitting is less. Pitting can still with small grafts if they are placed too deep.
  - These natural groupings combined with their ability to be placed in close proximity to one another closely mimic nature, thereby creating the highest degree of ‘naturalness’ on a consistent basis. They can be undetectable under close examination.
  - “Follicular Unit” grafts are the “Mercedes Benz” of micro grafts and are powerful tools for the hairline, Lateral Fringe, Temporal Points and Vertex.

• **Disadvantages**
  - Follicular units are more fragile than larger grafts and therefore more prone to injury and poor yield especially during placing. This can be overcome with experience and proper technique.
  - There is more potential for hair waste when cutting “follcular units” as compared to small minigrafts “cut to size”. Waste is distinctly different from follicular injury and poor growth. The term “waste” refers to hair follicles that are lost or discarded during the trimming process. Hairs transected during the donor harvesting process have the potential of being discarded during the trimming process. Intrinsically, the extensive trimming necessary to produce good quality follicular units increases this risk of waste. Waste can be eliminated but it takes a lot of effort and use of the Microscope.
  - Finally, because there are less hairs per graft, it takes a larger number of “follcular units” to move the same amount of hair to an area as with larger grafts. This ultimately makes the procedure more labor intensive, time consuming and costly.

SMALL MINIGRAFTS “CUT TO SIZE”

• **Description**
  - Small minigrafts “cut to size” contain an average of 3-4(5) hairs per graft. When preparing small mini grafts” cut to size” the physician asks for grafts that will fit a specific size recipient site. Based on the donor density a size is chosen that hopefully will contain an average of 3-4(5) hairs per graft. Grafts can be cut thin and flat for slits or more rectangular for small punches. I feel the best small minigrafts are thin and flat grafts for slits because the hairs line up linearly and this limits potential for compression. If used properly this type of graft can be almost as natural as a follicular unit graft and can simply look like 2 follicular unit grafts lined up behind each other.

• **Advantages**
  - These grafts are less fragile and therefore less susceptible to trauma and poor yield.
  - There is less potential for hair waste during graft cutting. The Microscope is not necessary with this type of graft.
  - Because there are more hairs per graft it takes less grafts to move the same amount of hair.
  - These factors make the procedure less labor intensive, time consuming, and costly.

• **Disadvantages**
  - In patients with high density there is a potential for grafts to contain greater than 3-5 hairs if the grafts are not checked. This increases the potential for compression and graftiness.
  - Because there is slightly more epithelium on these grafts there is an increase chance for pitting if the grafts are placed too deep.
  - Even when these grafts are cut and placed perfectly, they are not quite as natural as follicular unit grafts. This is especially true if only one session is done or on close inspection. The clinical significance of this is debatable.
FOLLICULAR UNITS”  
VS  
SMALL MINIGRAFTS “CUT TO SIZE”

**SUMMARY TABLE**

<table>
<thead>
<tr>
<th></th>
<th>FOLLICULAR UNITS GRAFTS</th>
<th>SMALL MINIGRAFTS “CUT TO SIZE”</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Number of Hairs/ Graft</strong></td>
<td>1-3 Hairs</td>
<td>3-4(5) Hairs</td>
</tr>
<tr>
<td><strong>Average Size of Recipient Site</strong></td>
<td>15 to 45 degree</td>
<td>69 beaver blade</td>
</tr>
<tr>
<td></td>
<td>sharppoint</td>
<td>15 c blade</td>
</tr>
<tr>
<td></td>
<td>Arnold #91 blade</td>
<td>1.25 punch</td>
</tr>
<tr>
<td></td>
<td>18 quage no-kor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>.75 – 1 mm punch</td>
<td></td>
</tr>
<tr>
<td><strong>Average Spacing Between Grafts</strong></td>
<td>1-2 mm</td>
<td>3-4 mm</td>
</tr>
<tr>
<td><strong>Exact number of hairs in each graft known</strong></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>Size of graft</strong></td>
<td>Small</td>
<td>slightly larger</td>
</tr>
<tr>
<td><strong>Amount of epithelium</strong></td>
<td>Very little</td>
<td>slightly more</td>
</tr>
<tr>
<td><strong>Potential for pitting</strong></td>
<td>Very little</td>
<td>slightly more</td>
</tr>
<tr>
<td><strong>Potential for waste with graft cutting The Microscope is a significant advantage</strong></td>
<td>High</td>
<td>Less</td>
</tr>
<tr>
<td><strong>Potential for injury</strong></td>
<td>Higher</td>
<td>Less</td>
</tr>
<tr>
<td><strong>Degree of Placing difficulty</strong></td>
<td>High</td>
<td>Less</td>
</tr>
<tr>
<td><strong>Time requirements</strong></td>
<td>High</td>
<td>Less</td>
</tr>
<tr>
<td><strong>Achievable Appearance of density</strong></td>
<td>Yes but takes more skill, and effort Has increased risk of low density</td>
<td>Yes and easier to achieve, Has increased risk of graftiness</td>
</tr>
<tr>
<td><strong>Degree of naturalness</strong></td>
<td>Extremely high and consistent</td>
<td>slightly less high and consistent</td>
</tr>
<tr>
<td><strong>Natural when finished --styled</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Natural when finished --unstyled</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Natural after one session</strong></td>
<td>Yes</td>
<td>Yes if micro used in hairline</td>
</tr>
<tr>
<td><strong>Natural with critical inspection (unstyled, close-up and wet)</strong></td>
<td>Yes</td>
<td>Less</td>
</tr>
<tr>
<td><strong>Undetectable with critical inspection</strong></td>
<td>Potentially yes</td>
<td>much less</td>
</tr>
</tbody>
</table>

TABLE 1- A COMPARISON OF THE PROPERTIES OF “FOLLICULAR UNITS” TO SMALL MINIGRAFTS “CUT TO SIZE”
Vídeos asociados a la presentación

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