



Hair Transplant: Challenges, Solutions and Guideline for Beginners

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The aim of this article is to summarize the challenges which might have to be faced by the beginners while setting up a hair transplantation practice. Hair transplantation is one of the most rapidly evolving procedures in aesthetic surgery that is steadily gaining attention in dermatology practice in the recent times. It is a very time-consuming and tedious procedure to be performed even by the trained practitioner. Hair transplantation is a procedure which needs highly skilled professional and helping labor. Hand and eye co-ordination are also utmost important to perform such delicate surgeries. Alcohol is a diuretic, meaning it will dehydrate you. This can prolong your recovery time and increase your risk of discomfort. Moreover, it can elevate your blood pressure to an unsafe level and reduce the supply of blood and crucial nutrients to your head. Avoid alcohol for the first five days after your procedure.

Keywords: Hair transplantation; dermatology; surgery.

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1. INTRODUCTION

Hair transplantation is one of the most rapidly evolving procedures in aesthetic surgery that is steadily gaining attention in dermatology practice in the recent times. It is a very time-consuming and tedious procedure to be performed even by the trained practitioner. Appropriate training is a pre-requisite before starting a hair transplant practice and to become a successful hair transplant surgeon one must follow the right surgical principles, a long-term approach and ethical practices. A complete multidisciplinary team comprising of hair transplant surgeons, anaesthesiologists and a few paramedics are essential in this competitive era to do more than 3000-4000 grafts in one session. The aim of this article is to summarize the challenges which might have to be faced by the beginners while setting up a hair transplantation practice.

1.1 Challenges in Setting up Hair Transplantation Practice are as Follows

1.1.1 Competition in the field

In the current scenario, Hair transplantation is believed to be one of the rapidly growing and money-spinning practice option [1]. Not only medical professionals but even corporate setups, spas and non-medicos are setting their foot in this field and making profit out of it. Therefore, one must keep in mind that they have to survive in this competitive world while practicing with ethics.

1.1.2 Training

Hair transplantation is a procedure which needs highly skilled professional and helping labor. Hand and eye co-ordination are also utmost important to perform such delicate surgeries. This skill cannot be acquired solely by watching workshops, listening to lectures or seeing videos on social media. An adequate clinical experience is essential to gain expertise in this procedure. Currently, there are very few centers which offer ample training in this field at affordable cost. So there might be many obstruction for a beginner to get proper training to be able to perform hair transplantation.

1.1.3 Armamentarium for FUE

1. Permanent surgical marker
2. Flexible marking scale

3. Anaesthesia device/Facial vibrator
4. FUE Machine/Micromotor
5. Hand piece Straight /angular
6. Punches 0.6-0.9 each (2)
7. Loupe
8. Extraction forceps-Angular/curve/capsular
9. Slit marking device Needle, blades/ Implanter
10. Graft content device/fridge/cooler/Icepack
11. Graft separator forcep-Straight/curve
12. Implantation forcep-adson Z Forceps/S-shaped/Angular/Curved/Straight.
13. Head band
14. Multipara monitor.

1.1.4 Skill of the surgeon

There are two techniques of harvesting follicles to perform hair transplantation surgery i.e. follicular unit extraction (FUE) and follicular unit transplantation (FUT). In FUE, the individual *follicular unit grafts* are extracted but the *method* of implantation remains the same. Whereas in FUT, a strip is surgically removed from the donor area, sliced into separate follicular units and implanted onto the recipient area. The number of assistants and skills required to perform Follicular unit extraction are less as compared to follicular unit transplantation. It requires a skilled professional to sliver strip of follicular grafts carefully under magnification. There are certain factors like follicular unit transection rate, body hair transplantation and ability to perform follicular unit extraction on different types of alopecia, implantation time, hairline designing, patient selection, which decides the skill of a professional to perform such surgeries. Therefore, regular practice is very much essential to develop these skills.

1.1.5 Follicular unit transection rate

The follicular unit transection rate is the number of grafts transected per 100 extracted grafts. A low follicular unit transection rate is required for better accuracy of follicular unit extraction technique. Optimum hair growth is achieved when follicular unit transection rate is less than 1%. [2]. This requires a adequately skilled operating surgeon. To keep the transection rate minimal, beginners can use a blunt punch and attain good depth control and practice proper positioning of the patient and surgeon, i.e., the prone position of the patient during follicular unit extraction technique on occiput and lateral posture during follicular unit extraction on temporo-parietal areas [2]. Accuracy can also be

increased by traction and counter-traction on the lax scalp [3]. While performing follicular unit transplantation, precise slivering of the strip should be done under adequate magnification by a trained surgeon to achieve good results.



Fig. 1. Hairline designing

Hairline design is the hallmark of each hair transplant surgeon. Its accuracy is directly proportional to patient satisfaction and therefore is of utmost importance. It takes years of experience to get a skill of achieving an accurate and artistic hairline. Apart from the hairline design, beginners should also primarily focus on surface anatomy and landmarks for designing a perfect hairline. The hairline should be irregularly irregular with a density of 25–30 grafts per cm² as compared to the central tuft. For hairline designing, follicular grafts with 1–2 follicles should be selected for implantation and grafts with 3 to 4 hair should be implanted on the vertex to give a fuller look to the scalp, with a density of approximately 40–45 grafts/cm² [Table 1].

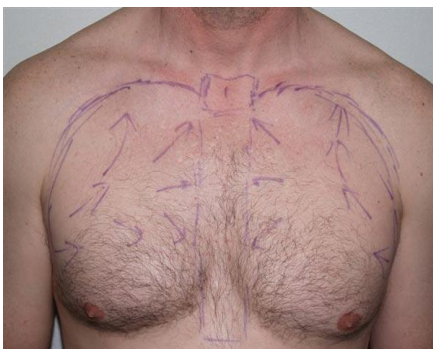


Fig. 2. Body hair transplant

Body hair is utilized when the safe donor zone of scalp is exhausted. The extraction of body hair is more difficult as compared to scalp hair as they lie in the upper dermis which has dense collagen. In such situations, body hair from chest, legs,

beard and moustache area, axillae or pubic hair are used for transplanting onto the scalp. For a Beginner, more attention should be paid initially on scalp hair transplantation techniques and on lower grades of androgenetic alopecia. Body hair transplantation require added expertise in hair transplantation surgery which can be achieved after gaining adequate skills.



Fig. 3. Anaesthesia for hair transplantation

Various techniques can be used for inducing anesthesia in hair transplantation surgery with or without nerve blocks, followed by ring block and infiltration:

1. Nerve blocks such as supraorbital and supratrochlear blocks given with 2% lignocaine with adrenaline
2. Ring block along the periphery of the recipient area with 2% lignocaine and adrenaline
3. Tumescence anesthesia is given after ring block in the recipient area. Tumescence anesthesia is made with triamcinolone (40mg/ml) + xylocaine (2%) + epinephrine, 1:1000 (1mL) + normal saline (100mL).

Accurate technique of using tumescence anesthesia for hair transplant surgery should be learnt by the beginners. It comprises of subcutaneous injections of relatively large volumes of diluted lignocaine and epinephrine. Concentration of vasoconstrictor should be kept at minimum in the tumescence mixture, as it may lead to acute loss of hair follicles after surgery. Besides, triamcinolone acetonide (40mg/mL) can be added to the tumescence solution to avoid any chances of post-operative edema and inflammation.



Fig. 4. Slit-making

Following Proper angulation while creating slits for the implantation of follicular units is extremely important [Table 1]. Otherwise, it may lead to an unnatural look to the patient. Apart from the angulation, depth of slit is of utmost importance as the 'too deep' placement of follicular units may lead to folliculitis and 'cobble stoning' at the recipient site. Too shallow slits may result in popping out of grafts [4].



Fig. 5. Implantation

"Out of body time" of the graft also plays a role in deciding yield of surgery. More the time lesser will be the yield. For beginners, the graft implantation procedure may require a much longer time as compared to a skilled surgeon and lead to lesser yield of surgery. So, help of a trained assistant is always advisable at the beginning stage of hair transplantation practice. Beginners should also avoid doing longer sessions in the very early phase of practice. Firstly skills should be developed by assisting senior surgeons and learning to perform mega and giga sessions of hair transplantation.

2. CASE SELECTION

The enthusiasm to do as much cases as possible in the beginning may force a newcomer to select every patient who asks for hair transplant surgery. Wrong patient selection can also lead to uninvited complications. Treating patients with

poor donor area, androgenetic alopecia of Norwood Hamilton grade IV or more, or medically unfit patients may result in an unsatisfactory outcome. A complete preoperative dermatological evaluation to determine the type of alopecia and pre-anesthetic medical fitness is a must to avoid untoward complications like failure of surgery, dermato-surgical emergencies and patient dissatisfaction.



Fig. 6. Hair transplant in women

Patterned hair loss in women is multi-factorial and poorly defined. This makes its surgical management much more challenging. Hair loss in women can be because of chronic telogen effluvium presenting as diffuse thinning of hair. Results of hair transplantation in women are often delayed and post-operative shock loss is common in female patients. Hence, beginners are advised not to go for treating female patients with hair loss at the beginning of their career.



Fig. 7. Scarring alopecia

Scarring alopecia is another area where one needs expertise to perform hair transplantation. Variable factors such as underlying disease pathology, cause of scarring, fragile tissue, activity in the diseased patch as reported in the histopathological examination, possibility of koebenerization, skin texture and condition of underlying dermis or subcutis should be taken into consideration while performing hair

transplantation in the area of scarring alopecia [5]. The chances of graft survival are also low because of blood circulation [5]. Beginners should avoid such cases or should take proper guidance before performing hair transplantation in such cases.

While setting up a hair transplant clinic one needs to have [6]:

- A good location
- Updated instruments
- Comfortable infrastructure
- Signboard, Logo,
- Impressive interior and entrance •
- Comfortable operative table and set up (multipara meter pulse oximeter, hair transplant OT bed, OT lights, comfortable stools and chairs). •
- Anesthesia trolley and crash cart including emergency drugs (adrenaline,

atropine, dopamine, sodium bicarbonate, IV fluids etc),

- Ambu bag, intubation equipment and oxygen supply. •
- A trained team of doctors (one to two hair transplant surgeons, anesthesiologist) and paramedics •
- Autoclave
- Marketing strategy
- Financial aid.

2.1 Developing a Team

Team work is very much important in Hair transplantationsurgeries. Quality of the work of the staff decides the results of the surgery. Getting skilled, dedicated and full time staff for hair transplantation is difficult these days. Training, multitasking and maintaining the team are again, challenging things.

Table 1. Recipient area and angles while making slits[4]

Recipient site	Angle of slit	Follicular units density	Pattern
Frontal hairline	Acute <45°	20- 30 grafts/cm2	Irregularly irregular.
Temporal areas	Acute <45°	30- 35 grafts/cm2	Radial pattern extending outwards or patient's natural pattern of hair angles.
Vertex	45°	40- 45 grafts/cm2	Whorled pattern.



Fig. 8. Establishing hair transplant setup

2.2 Preoperative Evaluation

Preoperative evaluation is necessary before starting with any surgical procedure. In case of hair transplantation, trichoscopy or histopathology (wherever indicated) should be done to determine the type of alopecia (scarring/nonscarring), assessment of the grade of androgenetic alopecia, evaluation of comorbid conditions, pre-anesthetic fitness etc. Taking all these measures helps a surgeon to practice safely with optimum results [7].

2.3 Preoperative Documentation

Documentation and record-keeping is important in any dermatological practice. An informed written consent should always be taken before starting with the procedure. Along with that, pre-operative checklist mentioning details about pre-medication and postoperative notes, pre-operative information sheet of do's and don'ts for the patient and follow-up sheet with all postoperative drug list with appropriate doses is mandatory. Clinical photographs before surgery and during each subsequent visit should be kept in records for checking outcome of the surgery.



Fig. 9. Achieving patient satisfaction

Achieving patient satisfaction is one of the most difficult jobs. Optimum patient selection and good accuracy in hair transplant surgery is the key to achieve ultimate patient satisfaction.

2.4 Dealing with Complications and Emergencies

A pre-anesthetic fitness is a must to avoid any untoward complications after surgery. A thorough trichoscopic evaluation will help to rule out other causes of alopecia such as alopecia areata, frontal fibrosing alopecia etc. Basic underlying or associated comorbid ailments should be taken

care of before starting with the actual transplantation procedure. A surgeon must be aware of possible dermatological emergencies such as vasovagal syncope, anaphylaxis, lignocaine toxicity etc. and should be capable of managing them. Operator should also be well trained in performing basic life support techniques. Longer sessions are riskier as they require a large amount of anesthetic agents and are associated with more fluid and blood loss. So, mega and giga sessions should be carefully opted in the initial phases of practice. Such procedures should always be done under supervision of skilled professional in the initial phases. It is safe to have an anesthesiologist attending the surgery to manage complications.

2.5 Specific Problems Reported Include

- Scarring
- Unnatural hairlines
- Poor hair growth
- Wrong hair direction
- Depleted donor area in the scalp leaving a bald appearance
- Infections and inaccurate graft counts.

In Today's world, there is an increasing demand for publicity and marketing. Different marketing teams are being hired by People for advertising of clinical practice. But it takes a bit of investment which a beginner might not be able to afford in the starting phase of his career. Mouth-to-mouth publicity by the satisfied and happy patient is the best marketing tool for a beginner. In an attempt to attract more patients, a doctor should be particularly careful to avoid unethical advertisements and fake commitments like unlimited grafts, 100% guarantee of hair growth and so on.

2.6 Role of a Maxillofacial Surgeon

A maxillofacial surgeon makes a good hair transplant surgeon as they are well trained in surgical anatomy of the head, neck & face with a detailed knowledge of local & distant flap design and through in-depth working knowledge of the local anaesthesia management. They have a great aesthetic sense with artistic hands and are well versed with cephalometric analysis which comes handy in judging facial proportions and hairline placements, further most of them are very well adapted to handling the rotary handpiece from their formative training. Maxillofacial surgeons are well trained

exclusively in head and neck surgery for 3 years and are competent at managing wounds and infections, thus justifying their qualifications to perform hair transplantation alongside plastic surgeons and dermatologists [7].

2.7 Things to Avoid After Hair Transplant Procedure

2.7.1 Driving

Sometimes, hair restoration is performed under strong sedation. If you have been given a sedative, do not drive for the next 24 hours. Make sure you have someone to drive you to and from your appointment.

2.7.2 Sleeping flat

To mitigate the risk of swelling, it is essential that you sleep with your head elevated for the first seven days after treatment. Some clients find they only need to sleep with their head elevated for a few days. Keep in mind, however, that not everyone experiences swelling after hair implants. If you don't feel a slight pressure around your forehead, there is no reason why you can't sleep as normal.

If you find you are experiencing mild swelling, we recommend converting your recliner into a temporary makeshift bed. It's not ideal, but some people find their recliners to be far more comfortable than sleeping on top of four pillows. Aim to keep your head elevated by 45 degrees.

2.7.3 Ignoring your labels

One of the worst things you can do after your hair transplant procedure is to ignore the labels on your prescription and over-the-counter medications. Antibiotics should be taken exactly as prescribed to mitigate the risk of infection. Moreover, you should not drive after taking prescription analgesics if the warning label advises you against operating heavy equipment and machinery. You also want to make sure you're not taking too much of any type of medication. Finally, take your medication with a meal if advised on the label. Taking certain medications, especially painkillers, on an empty stomach can cause gastrointestinal distress.

2.7.4 Forgetting the Ice

Do you remember the RICE technique your parents taught you when you got hurt as a child? The key to treating swelling "injuries" is rest, ice,

compression and elevation. We've already covered the elevation. If you experience any swelling, we strongly recommend that you apply ice for 20 to 30 minutes just above your eyebrows. This is an excellent preventative measure, as well. Even if you don't have any swelling, you may want to do this three to four days after your hair restoration. You may even find that ice is all you need to ease any general discomfort you're feeling [8].

2.7.5 Scrubbing your hair or shower

For the first 48 hours after your hair transplant procedure, do not wash your hair. On the third day after treatment, you can wash your hair gently. Do not wash your hair too aggressively through the fifth day after treatment. Also, do not blast the stream onto your scalp directly. Rather, use a cup to rinse shampoo out of your hair. If you suffer from itching, you may apply a conditioner to your scalp gently [9].

2.7.6 Dyeing your hair

You can't die your hair within four weeks of your hair restoration. If you feel like you can't make it four weeks without dyeing your hair, get it done shortly before your treatment. There are no negative side effects associated with dyeing your hair shortly before your hair transplant procedure, but afterward, the harsh chemicals found in hair dye can compromise the success of the transplanted follicles. For several weeks after the transplantation, the transplanted follicles are in an incredibly fragile state. They need all the care they can get [10].

2.7.7 Forgetting to drink water

We all know that water is crucial for life, but not everyone knows that hydration is even more important before and after your transplant. The more hydrated you are, the more comfortable you will be and the faster you will recover. Spending a couple of weeks making a conscious effort to drink 10% more water can make a massive difference in your entire recovery process. To ensure you are drinking enough water, we strongly recommend that you download an app on your phone to remind you to drink a cup (8 fl. oz.) of water every hour while you are awake.

A good general rule of thumb is that you should drink half of your body weight in ounces of water. For example, if you weigh 120 pounds, you should drink 60 ounces (7.5 cups) of water daily.



Fig. 10. Preoperative & postoperative

However, this doesn't apply perfectly in every situation. To determine if you're drinking enough water, check your urine. It should be translucent to very pale yellow.

2.7.8 Assuming your hair won't fall out

Many people don't think that their hair will fall out after hair transplant surgery, but this is a perfectly normal, healthy part of your natural hair growth cycle. Roughly 10% to 15% of your hair is in the "shedding" phase at any given time. If you notice shedding within the first two to four weeks after your treatment, don't panic. Your follicles aren't damaged. In three months, new hair will have grown out of those follicles stronger, healthier and thicker than ever.

2.8 Sleeping on Your Tummy

A lot of us sleep on our stomach or toss and turn at night. However, you have to be careful in the first week after your treatment to not sleep on your stomach or side. Do not rub your new hairline against your pillow. If you can't stop yourself from tossing and turning at night, buy a weighted blanket or sleep on a recliner. It's a small sacrifice, but it ensures that you don't jeopardize the results of your treatment.

2.9 Applying Ice Directly to the Scalp

Just as it's important to avoid rubbing your new hairline on your pillow, it's important to not apply ice directly to the areas of your scalp with transplanted hair. In fact, you should do your best to avoid touching the area at all for the first three days after treatment. After 72 hours, you should only touch your scalp very gently. Remember, you should gently apply conditioner to an itchy scalp rather than scratch it [11].

2.10 Soaking Up the Sun

Avoid exposing your scalp to direct sunlight between 10 AM and 2 PM for the first two weeks

after your hair transplant. If you have to go outside during that time, don't stay out too long. If you're using your hair restoration as an excuse to go on a vacation to "recover", make sure you're protected from potential sunburn and that you don't go scuba diving.

2.11 Wearing All Your Sports Gear

You may have a ball cap that matches your Seahawks jersey that you feel you have to wear. However, you should not wear a hat within 72 hours of your treatment. Scabs are a perfectly natural "side effect" of hair transplantation, but until they have had enough time to solidify, do your best to keep anything from touching the treatment site.

2.12 Going for a Personal Record

In the days after your hair transplantation, do not engage in heavy exercise or any other form of exertion. This means now is not the time to try and shatter a personal lifting or sprinting record. There's nothing wrong with light to moderate exercise: just keep your heart rate and blood pressure within a safe, normal range for the first seven days after your treatment.

Brisk walks, yoga and tai chi are excellent substitutes for your typical workout routine for the first seven days after treatment. Three days after your treatment, you can even go on a moderately paced bike ride. Just don't forget your helmet and reflective gear.

2.13 Sweating It Out

Unfortunately, it's not enough to avoid strenuous exercise for the first week after hair transplantation. Avoid any other activity that can cause you to sweat heavily, such as unwinding in a sauna.

2.14 Drinking and Smoking

Alcohol is a diuretic, meaning it will dehydrate you. This can prolong your recovery time and increase your risk of discomfort. Moreover, it can elevate your blood pressure to an unsafe level and reduce the supply of blood and crucial nutrients to your head. Avoid alcohol for the first five days after your procedure.

If you're a smoker, try to quit a few months before your hair transplantation. Quitting is hard, and it also elevates your blood pressure. Depending on your natural blood pressure, smoking could elevate your blood pressure all the way to a dangerous level. Remember, blood flow is essential for the growth of new, healthy hair. Abstain from nicotine, such as e-liquids, cigarettes, cigar, nicotine gum and nicotine patches, for the first 31 days after your treatment.

2.15 Having Sex

You will need to abstain from sex for the first seven days after your hair transplantation. People often argue that sex lowers blood pressure, and while it's true that regular sex helps to lower blood pressure over the long-term, during sex itself your blood pressure and heart rate always go up. There is a very good chance that your heart rate, blood pressure or both will become too high for the health of your transplants. Moreover, there is a risk of sweating and the treatment site being touched during sexual intercourse. This can affect the healthy formation of scabs and increase the risk of infection.

2.16 Eating Fast Food

Fast food is convenient, and you may not feel like cooking during recovery. However, nutrition is nearly as important as healthy blood flow and adequate hydration during your recovery period. Your hair needs lots of nutrients to grow thick, healthy, soft, sleek, strong and beautiful. Unfortunately, fast food is typically devoid of nutrients and full of empty calories. If you're struggling to get enough nutrients in your diet, look for a supplement that includes calcium, magnesium, protein, iron, vitamin B6, zinc, biotin and lots of protein. If you eat enough protein, you shouldn't need to supplement with any specific amino acids [12].

2.17 Having Your Cake and Eat It, Too

As important as it is to avoid fast food, it is even more important to avoid soda, processed juice,

baked goods and other foods that contain lots of sugar. Not only are these foods and drinks lacking nutrients essential for your hair health, they can also cause you blood sugar issues that will prolong your recovery experience.

3. CONCLUSION

Hair transplants are lengthy procedures. A typical session of 1500 to 2500 grafts utilizing 4 assistants will last approximately 6 to 7 hours. The procedure is conducted using a clean technique with sterilized or disposable instruments. Postoperatively, the recipient sites and donor area are typically not bandaged, and perioperative antibiotics are not prescribed on a routine basis. Patient instructions include head elevation and icing of the forehead and donor area, along with analgesics. Aloe ointment administration to the grafted area and gentle shampooing in the shower should commence on postoperative day 2. Most of the recipient site eschars are gone by day 10, and donor sutures are removed on day 14. Although there are exceptions to the rule, most grafts enter a telogen phase for the first 3 months prior to entering their anagen phase. Full growth and evaluation of transplant results cannot reliably be assessed for 8 to 12 months following the procedure. The future of Hair transplant surgeries and the treatments for alopecia are centered on minimal- incision surgery as well as cell-based therapies.

CONSENT AND ETHICAL APPROVAL

As per international standard or university standard guideline participant consent and ethical approval has been collected and preserved by the authors.

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Authors have declared that no competing interests exist.

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