



Evolution of Hair Transplant Surgery in India: A Plastic Surgeon's Perspective

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Abstract

Keywords

- ▶ hair transplant
- ▶ plastic surgery
- ▶ follicular graft
- ▶ punch graft
- ▶ scalp reduction

This article is mainly aimed to delve into the history of hair transplant and its evolution in India. As a plastic surgeon in practice for the past 35 years, I have seen hair transplant surgery undergoing various transformations starting with initial use of plugs and flaps. Scalp reduction surgery also played an important role. Plugs slowly gave way to mini- and micrografts. With the incorporation of the microscope and popularizing of strip surgery and improved slivering techniques, mega sessions came to the fore thereby covering large areas. Follicular unit extraction and use of body hair have also been discussed.

Introducing Hair Transplant to Plastic Surgeons

In the late seventies and early eighties, hair transplant was just evolving; it was the period when plugs and punch grafts were being used though not commonly to tackle the problem of baldness. One of the earliest plastic surgeons to do punch grafts for male pattern baldness was Dr. S. Arumugam, a Board certified Plastic and Cosmetic Surgeon who was practicing in the USA. He used to visit India periodically in the seventies and was instrumental in popularizing aesthetic surgery in India. He is probably the first plastic surgeon to demonstrate punch grafts for male pattern baldness in India. I happened to see one of his procedures in 1986 and it got me interested.

Punch Grafting

It is based on the basic principles of hair transplantation that were documented by Dr. Orentreich¹ in his landmark work wherein he had mentioned about safe donor area and the theory of donor dominance. However, Japanese dermatologist Dr. Okuda² had used small hair-bearing autografts for scars and cicatricial alopecia almost 20 years earlier. Punch grafting involved harvesting of hair from the scalp and was done using sharp punches of 4 to 5 mm diameter.

Usually 30 to 50 grafts (▶Figs. 1 and 2) were harvested. They were then defatted and any loose hairs removed. These were placed into holes that were also made using sharp punches or trephines but were usually a shade smaller than the donor punches to get a snug fit. Usually the distance between each punch used to be one punch size. Thus, for completion of the hair restoration, four sittings were required at the end of which the front area was covered (▶Fig. 3). The procedure was done under local anesthesia and would take ~1 hour with 1 to 2 assistants. Initially, the punches were rotated by hand to do the extraction. But very soon punches were made to fit motor-driven hand engine or micromotor. A firm dressing was applied over a layer of Vaseline gauze that was kept in place for 2 days. The dressing was then removed. The donor area was allowed to heal by secondary intention that took ~2 weeks. The transplanted hairs used to fall after 2 weeks along with the scabs and would start growing around 4 months. Though the procedure was hugely successful as far as hair growth was concerned, aesthetically, it left a lot to be desired. During the same period, plastic surgeons were involved in other types of surgeries for correction of male pattern baldness. They could be categorized as flaps and scalp reduction.

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Fig. 1 My early documentation of punch graft.

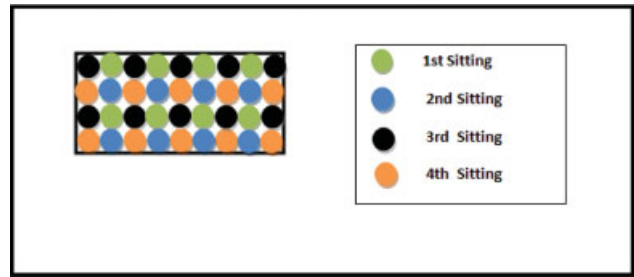


Fig. 3 Sequence for punch grafting.



Fig. 2 (A) Recipient site holes. (B) Hair growth after first sitting of punch grafting. (C) A 4 mm motor-driven punch.

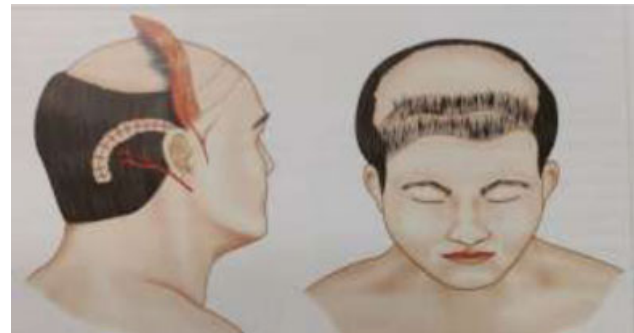


Fig. 4 Diagram illustrating Juri flap. Courtesy Dr. Sandeep Sattur.



Fig. 5 Juri flap pre- and postoperatively.

Flaps

Among the flaps, two were popular. One was the Juri flap (► **Fig. 4**),³ which was also known as TPO—temporo-parieto-occipital—flap, and the other was the Elliot’s flap.⁴

The Juri flap was done as a staged procedure and was based on the posterior division of the superficial temporal artery.

The flap was usually delayed to improve the safety and blood supply thereby making it possible to harvest a long flap. The flap was used to recreate the anterior hair line while the donor site was closed primarily. The flap being fairly wide (1.5–2 cm wide), closure of the donor site was quite tight and hence often resulted in wide donor site scars. A similar flap from the opposite side was also used to cover the area behind the first flap. A dog ear correction was also usually necessary. Though the hair growth was good and mostly there was no effluvium, and the hairs continued to grow without shedding, there were a couple of issues. The most important was the direction of hair growth, which was opposite to the natural growth. Further donor site scars were often wide and visible.

The problem of direction of hair growth was corrected by doing a “free” TPO flap^{5,6} that was anastomosed to the anterior division of the superficial temporal artery of the opposite side. This helped reversing the direction of hair growth to make it more natural. The scar of the flap inset (► **Fig. 5**) could be later camouflaged by grafts.

Scalp Reduction

This was another procedure that was used to reduce the bald area before embarking on punch grafting.⁷ This involved removal of a strip of bald skin either in the form of an ellipse or even as a “Mercedes sign” or a “fish tail” (► **Fig. 6**). It was done under local anesthesia and involved excision of the bald strip followed by wide undermining of the adjoining advancement flaps to bring their approximation.

This procedure helped in reducing the bald area. It was usually repeated after 6 months or more, thereby further reducing the bald area (► **Fig. 7**). It resulted in raising the “parietal humps,” thereby helping to start a hair line a little more higher. Further there were more grafts available for a smaller area, thereby improving the quality and density of



Fig. 6 Diagram showing scalp reduction. Courtesy Dr. Sandeep Sattur.



Fig. 7 After first sitting of scalp reduction; after second sitting of scalp reduction.

coverage. The amount of skin removed would depend upon the laxity of the scalp. Frechet⁸ suggested the use of scalp extender that was an elastic silicone device placed under the advancing flaps below the galea before closure. This device helped in bringing the scalp edges even closer ("CREEP"), thereby permitting a second scalp excision procedure earlier.

Mini- and Micrografts

With more and more importance being given toward the aesthetic appearance, there was a trend toward use of smaller grafts. These were called minigrafts. I started using minigrafts in the early 1990s. Usually the larger punch grafts were divided into four units, and thus minigrafts were produced. Smaller punches had also been developed with 2 to 3 mm diameter. These were also used for harvesting. I used them for harvesting as well as drilling of recipient holes with the help of a micromotor. Starting from 30 to 50 plugs, we were now doing sessions of 300 minigrafts. The donor area was allowed to heal by secondary intention. Use of minigrafts improved the aesthetic results. Single-hair micrografts^{9,10} further improved the quality of results aesthetically. Density also needed to be addressed.¹¹ A combination of minigrafts and micrografts could provide density as well as reduce the "visibility" of the transplant (– Fig. 8).

Strip Harvesting

In the meantime there was a shift from use of punches to strip harvesting. By the late 1990s, I moved over from harvesting minigrafts by punches to strip harvesting. Initially a multiblade knife was used and by this method, thin long strips of hair-bearing skin were excised. From these

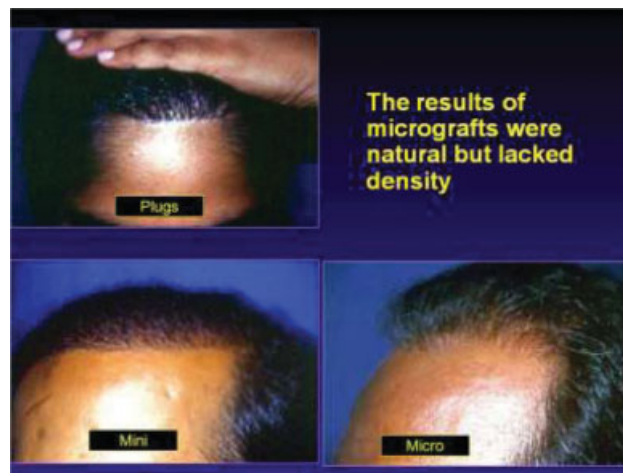


Fig. 8 Comparing different types of grafts.

strips, minigrafts were cut. This was usually done with the help of loupes and visors. I used the "cataract knife" to make slits and inserted the grafts by sliding them along the side of the knife into the scalp.

The next shift was to excise an ellipse of skin usually ~1 cm wide and 7 to 10 cm in length. This was harvested and the donor area defect closed primarily. From the harvested strip, minigrafts and micrografts were cut. Strip harvesting and closure resulted in better wound healing of the donor site by primary intention.

By early 2000, the sessions were becoming longer and more grafts were being transplanted. The operating microscopes and dissection microscopes were being used in graft dissection. These were initially used to reduce neck strain associated with constant bending for long hours with the use of loupes and visors. It was also at this time that I started using hypodermic needles to make slits while using the stick and place method. I had all along used the technique of holding grafts by the hair and inserting them rather than dragging them from the fat-laden root end, which was conventionally done.

Follicular Units

Studies had indicated the existence of natural units called follicular units. Headington¹² is credited with identifying the follicular unit that comprised of the hair follicles ranging from 1 to 4 hairs along with the pilosebaceous units. So when we started using higher magnification, we were able to start identifying the follicular units. Thus the trend to harvest the strip and dissect the follicular units under the microscope was the next step. Slivers, which were basically very thin slices of strip with one row of hairs in width, were dissected and these were further cut into follicular unit grafts.

The strips could now yield 1,000 to 2,000 follicular units. The surgeries were now taking more time and required more man power. The focus was shifting to larger sessions. More yield was possible by harvesting the maximum length and width of the strip. Besides this, minimizing wastage while harvesting resulted in increased number of follicles. Superficial incisions followed by deepening under vision using traction and counter traction helped in reducing hair loss in the cut edges. The next step was to reduce the visibility of the

donor site scar. As plastic surgeons we were always trying to improve on scars. This was achieved with the use of trichophytic closure. In addition, I have used nonabsorbable sutures (3.0 Ethilon) for dermal subdermal closure to prevent widening of the scar as early as 2003. These permanent buried sutures help in holding the dermal edges together while PDS Rapid is used for skin closure.

Creating a Natural Hair Line

While increasing the number of follicular units for transplantation was being looked into, there was also importance being given to the artistry in designing the hair line, its location, and the fact that it was not merely a line but a zone ~1 cm in width with very fine hairs scattered in an irregular fashion also known as “snail tracking.” The frontal tuft was given more density to make it look more natural.

Donor Site Scar

Strip surgery did have certain issues: one was the donor site scar and the other was associated numbness. Repeat surgeries sometimes resulted in wide scars, and if the harvest was in a new area it resulted in an additional scar. Usually, these scars were covered by the hairs above but were difficult to hide if someone sported short hair or if the scar was wide (► Fig. 9).

Advent of FUE

It was this fact that drove the hair transplant surgeon to look for other options to use small punches. Dr. Ray Woods had conceived this idea of extraction, though this had not been published. The problem using a small punch was transection of hairs.

So the procedure had to be done very carefully and slowly. Hence the speed was less and FUE or follicular unit extraction (now called excision) was found to be tedious and slow. But it was a step in the right direction. The initial process was using a manual punch, and it involved coring of the epidermis with a sharp punch and deepening it using a dull punch to cut the arrector pili. This resulted in the follicular unit becoming loose and it was then pulled out usually using a three-step technique of grasping the unit with forceps, while depressing the scalp with another, and then regrasping the follicle and pulling it out. Rassman et al¹³ are credited for developing and popularizing the technique. Although the procedure was very slow and labor intensive, it was possible to harvest good-quality anagen grafts by cherry picking. The donor site scars were less (► Fig. 10) visible. Having been very comfortable with the strip surgery, it was now a decisive change. So I started combining manual extraction along with the strip surgery to gain some experience. I realized that it was a very slow, time-consuming process and was not sure if it was going to be practical especially in a corporate hospital setup.

With the advent of the motor-driven SAFE—surgically advanced follicular extraction—system of Harris,¹⁴ things began to speed up. The dull punch reduced transection while the motor helped in easier penetration of the scalp. And since I had used the micromotor for many years, this was very much to my liking. I started using the SAFE system in 2011.

Subsequently various improvements in the designs of the punches were seen. Different varieties of sharp punches, serrated punches, Trumpet punches, etc. came into the fray,



Fig. 9 Wide strip scar.



Fig. 10 Follicular unit extraction scar.

each having its own proponents and advantages. Rotary machines, oscillation machines, vacuum-assisted devices, and even robotic FUE, all were aimed to get maximum extraction with least burden on the surgeon. Moreover, the procedure could be spread over 2 days.

Role of Beard and Body Hair

Recognition of beard and body hair as donor sites was a very important step in getting additional grafts. The beard happened to provide a very good number of follicles in patients having dense beard. Further, the growth cycles were also similar to scalp hair. Body hairs were less ideal but could provide a good mixture when transplanted along with scalp hairs. Thus FUE opened up the doors to new donor

sites, thereby helping to increase coverage of large areas of male pattern baldness. But FUE had its own share of problems like overharvesting of donor area, moth eaten appearance, harvesting from outside the safe zone.

Minimizing IRI

Since FUE procedures took much longer time, it was important to minimize the ischemia response injury (IRI); it was necessary to keep these units in chilled saline or even use other holding solutions. It was also necessary to develop techniques to minimize out-of-body time. Improving skills to increase speed of extraction and minimizing transection was the key. Harvesting a certain number and implanting them followed by harvesting another set of follicles was another way to reduce IRI. Harvesting and simultaneous implanting using implanters into premade slits could also minimize out-of-body time, resulting in less effluvium.

Nonshaven FUE, long hair FUE, or follicular unit transplantation have also been done. Research work toward hair cloning is also in progress.

Conclusion

As a plastic surgeon doing hair transplant, one is usually comfortable with both the techniques. It is important to select what would be a good method for a particular patient. It is also important to harvest from the safe donor site to maintain longevity of the transplanted hairs. Both the techniques still find a place and they complement each other.

Conflict of Interest

None.

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