‘Hair Color Repigmentation in the Recipient Area ‘: A Newly Recognized Phenomenon after Hair Transplantation

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Abstract

Background: Hair color repigmentation in the recipient area is a newly detected phenomena after hair transplantation. It’s detected especially in patients with gray or white hairs in the donor area, in which transferring these follicles to the recipient area stimulate them to regain their original blackish color, this may occur due to various stimulants that release during wound healing of slits after hair transplantation that trigger melanin production within the melanocyte inside the hair roots and promote hair repigmentation in the recipient area.

Aim: The aim of this study was to detect the frequency of hair color repigmentation phenomena in the recipient area after hair transplantation.

Patients and Methods: In this retrospective observational study, we detect thirty-four patients that develop hair color restoration phenomena in the recipient area after undergoing hair transplantation throughout a 1-year follow-up period. 1438 patients that undergo hair transplant between August 2021 and May 2023 were enrolled in this study among them 34 patients with white or gray hair in the donor area were vulnerable to hair color restoration phenomena, each patient was assessed both objectively and subjectively to evaluate the frequency of occurrence of this phenomenon and the percentage of hair follicles restore their original blackish color that transplanted to the recipient area.

Results: Thirty-four patients with white or gray hair in the donor area were enrolled in this study that completed 1-year follow-up period. The evaluation score includes (percentage of patients show hair color restoration in the recipient area after hair transplantation, percentage of hair follicles show change in their original color, degree of color restoration among transplanted follicles in the recipient area) and patient’s satisfaction score showed greater positive results in which the majority of the patients with white or gray hair in the donor area restore their original blackish color of their hair after transplanted to the recipient area.

Conclusion: Hair color repigmentation in the recipient area is a newly detected phenomena after hair transplantation surgery. Most patients with white or gray hair in the donor area show regain their original blackish color of their hair follicles in the recipient area after hair transplantation. We think that detecting this phenomenon will give us insight about how we can restore the original color of our white or gray hair by understanding the mechanism of how the melanocytes within the hair root regain their ability of melanin production after hair transplantation.

Keywords
Hair transplantation, Hair color repigmentation, Follicular unit extraction, Melanin production.

INTRODUCTION

Hair transplantation is a prevalent and efficacious surgical intervention utilized to augment the visual appeal of individuals experiencing hair loss and reinstate hair density. The process entails the extraction of hair follicles from a donor site, which is commonly the back or sides of the scalp, and subsequently applying them to areas afflicted with baldness or hair thinning. In addition to restoring hair coverage, the restoration of natural hair color is a crucial component in attaining a favorable result following hair transplantation. The procedure is frequently employed in the management of androgenetic alopecia, the prevailing etiology of hair loss (also referred to as male or female pattern baldness). Additionally, it can be utilized to treat hair loss caused by burn, trauma, or scarring on the scalp.

Hair transplantation employs two principal techniques: follicular unit extraction (FUE) and follicular unit transplantation (FUT). FUT involves the surgical removal of a swath of hair-bearing scalp from the donor site, followed by the dissection and preparation of
the individual hair follicles for transplantation. Following this, sutures are placed at the donor site, resulting in a linear incision. Individual hair follicles are extracted from the donor area via FUE with the use of a small punch instrument, which typically results in the healing of minuscule puncture incisions devoid of discernible scars. FUE is non-invasive and eliminates the need for a linear incision².

After the donor hair follicles are harvested, they are carefully implanted into the recipient area of the scalp using specialized instruments. The surgeon meticulously places the grafts to ensure a natural-looking hairline and proper distribution of hair density. Following the extraction process, the donor hair follicles are meticulously inserted into the designated region of the scalp utilizing specialized instruments. Placing the grafts with great attention to detail, the surgeon guarantees an aesthetic hairline and an even distribution of hair density³.

Hair follicles that have been transplanted experience a recurring pattern of shedding followed by regrowth. A few weeks following the procedure, the transplanted hair typically begins to fall out, but the hair follicles remain intact. In the months that follow, both new hair growth and the regrowth of transplanted hair commence. 6 to 12 months is the typical time required to observe the final results, which include increased hair density and a more natural appearance⁴.

Numerous variables affect the pigmentation of hair that has been transplanted, such as the donor site, hair properties, and the technique employed throughout the transplant process. Because the hair follicles are extracted from the patient’s scalp, the transplanted hair typically retains its original color⁵. However, in our experience we notice in some instances, there may be a noticeable difference in hair color between the transplanted and native hair. This occurs especially in patients with gray or white hairs in the donor area, as the transplanted hair follicles undergo marked changing in their color with restoration of their original black color or darkening of the gray hair after their regrowth in the recipient site, we think these phenomena occur due to restoration of melanin production or changes in the hair cycle that occur due to various stimulants that release during wound healing of slits after hair transplantation that trigger melanin production and promote hair pigmentation.

Melanocytes generate the pigment melanin, which gives human hair its color. Pheomelanin and eumelanin are the two types of melanin found in human hair follicles. The variability in hair color is primarily determined by the proportion and quantity of reddish-brown pheomelanin and black-brown eumelanin. In the process of hair development, melanocytes translocate pigment into keratin-containing cells. Over the course of time, melanocytes persistently introduce pigment into the keratin (which is the protein constituting hair) thereby imparting the special hue to the hair⁶–¹¹. The production of melanin will diminish with age. The original color of the hair will transform to gray and eventually to white. Gray hair is the consequence of pigment depletion, whereas white hair is pigment-free¹².

Normally our black hair is turn white as we get older¹³. However, hair changing its color and turning white can happen at any stage of your life. Even a teenager or someone in their 20s can have white hair. It is known as premature graying of hair. This is the result of additional variables that alter the pigmentation of hair, causing it to become lighter or darker. These factors have been divided into intrinsic and extrinsic factors; Intrinsic factors include (genetic factors, vitamin deficiency, stress, medical conditions, smoking), Extrinsic factors include (Chemical exposure, Climate, Pollutants, Toxins).¹⁴–¹⁸

In summary, hair color restoration constitutes a critical component of restoring hair aesthetic. A multitude of approaches, such as the utilization of hair pigment, laser therapies, and transplantation technique advancements, can be implemented to improve the color coherence between transplanted and native hair. However, some of these approaches are still under investigations and required to refine these methodologies and establish guidelines supported by empirical evidence in order to guarantee consistent and enduring hair color restoration. We think that detecting the phenomenon of hair color restoration after hair transplantation will give us an insight regarding the mechanism by which we can restore the original color of our hair.

2. PATIENTS & METHODS

2.1. Patients

In this retrospective observational study, we detect thirty-four patients that develop hair color restoration phenomena in the recipient area after undergoing hair transplantation throughout a 1-year follow-up peri-
od. 1438 patients that undergo hair transplant who underwent Follicular Unit Extraction (FUE) at our institution between August 2021 and May 2023 were enrolled in this study among them 34 patients with white or gray hair in the donor area were vulnerable to hair color restoration phenomena, each patient was assessed both objectively and subjectively to evaluate the frequency of occurrence of this phenomenon and the percentage of hair follicles restore their original blackish color that transplanted to the recipient area.

The patients included in this study were those with good general health, not complain from any chronic diseases, with the donor area characterized by high percentage of white or gray hair (more that 50%). While patients with the following criteria were excluded from the study; Presence of any chronic diseases, percentage of white or gray hair in the donor area less than 50 %) and patients who use hair dyes or black henna for hair coloring during the follow-up period.

Patients were evaluated weekly in the first month after the operation and then monthly until 1- year period. In order to document the hair growth in the recipient area after transplantation, a high-sensitivity Canon EOS 2000D (Rebel T7) DSLR Camera was utilized to acquire high-quality colored photographs of all the participating patients with each visit. In consideration of camera parameters, distance, and illumination, any potential for variation was eliminated. Informed consent was obtained from all participants in accordance with the tenets of the Declaration of Helsinki, the authors take approval from all participants to use their images and their personal clinical information for publishing.

2.2. Operation Protocol

All thirty-four patients who enrolled in this study undergo Follicular Unit Extraction (FUE) at our institution, A ring block was administered to the frontal and/or occipital cranium by infiltrating a solution containing 2% lidocaine and 1:100,000 adrenaline through a 31-gauge needle with the using of a Dermojet device. In preparation for slitting, a tumescent solution containing 1:100,000 adrenaline was injected into the entire recipient site subsequent to the administration of ring anesthesia. The grafts were harvested using a 0.9 mm punches. At the recipient site, incisions were made using the SP90 blade, with variations in width and depth determined by the graft length and size in different subjects. The incisions ranged in size from 0.9 mm to 1.5 mm.

The initial transplanted hairs often shed within the first few weeks after the procedure, which is a normal part of the process. Typically, new hair growth begins around three to four months after the hair transplantation. At this stage, thin, fine hairs starting to emerge from the transplanted areas. Over time, these hairs will continue to grow and thicken. In most cases, significant improvement in hair density and coverage can be observed within six to twelve months after the transplantation as hair growth is a gradual process.

2.3. Evaluation

The participants in this study were assessed both objectively and subjectively regarding the degree of color restoration among transplanted follicles in the recipient area by the following methods:

A: Objective methods:

All patients have been assessed blindly by two independent expert dermatologists, in which both the donor and the recipient areas have been evaluated to determine the original color of the hair in the donor area before the transplantation and then to assess the degree of hair color restoration in the recipient area and the percentage of hair follicle show these changes each visit after the operation until the end of the follow up period after 1 year. Photographs has been taking for both the donor and recipient areas with each visit to follow up the hair color changing. The following methods have been used:

1- Percentage of patients show hair color restoration in the recipient area after hair transplantation which was graded using a five-point scale, include:
   - Negative (those show changing in hair color from black color to gray or white color)
   - Failure (those show no changing in the hair color)
   - Moderate (those with majority of the hair changing from white into gray color)
   - Good (those with majority of the hair changing from gray into black color)
   - Excellent (those with majority of the hair changing from white into black color)

2- Percentage of hair follicles show change in their original color; the assessors determined the percentage of follicles undergo hair color restoration process in each participant using video trichoscope; which was graded using a six-point scale, include:
   - Failure (0 % follicles), Mild (1-25 % follicles), Moderate (26-50 % follicles), Good (51–75 % follicles), Excellent (76–99 % follicles), Perfect (100 % follicles).
3- Degree of color restoration among transplanted follicles in the recipient area; the assessors determined the degree of variation in hair color restoration process in each participant using video trichoscope; which was graded using a five-point scale, these include:
- Grade (0): Percentage of hair follicles show negative change in their original color from black color to gray or white color.
- Grade (1): Percentage of hair follicles show no change in their original color
- Grade (2): Percentage of hair follicles show change in their original color from white color to gray color
- Grade (3): Percentage of hair follicles show change in their original color from gray color to black color
- Grade (4) Percentage of hair follicles show change in their original color from white color to black color

B: Subjective methods: -
The satisfaction levels of patients regarding the degree of color restoration among transplanted follicles in the recipient area were documented using this method. Patient satisfaction was assessed using a five-point scale; in this a scale a score of zero denoted complete dissatisfaction, while a score of five indicated complete satisfaction.

2.4. Statistical Analysis
The statistical analysis utilized in this study was Version 20 SPSS (Statistical Analysis for the Social Sciences). Descriptive statistics included numbers, percentages, means, ranges, and standard errors. To analyze the data, the independent sample t-test and paired sample t-test were employed. P value ≤ 0.05 was regarded as significant.

RESULTS
Thirty-four patients with white or gray hair in the donor area were enrolled in this study that completed 1-year follow-up period. The evaluation score includes (percentage of patients show hair color restoration in the recipient area after hair transplantation, percentage of hair follicles show change in their original color, degree of color restoration among transplanted follicles in the recipient area) and patient's satisfaction score that showed greater positive results in which the majority of the patients with white or gray hair in the donor area restore their original blackish color of their hair after transplanted to the recipient area.

In this study, all the thirty-four participants where male with the mean ages were (52 ± 5) years and the mean duration of baldness was (33 ± 5) years. The total grafts harvested in those patients was (6017 ± 854) with a density ranging between 40-60% (Table 1).

Thirty-one participants (91.2%) show hair color restoration phenomena in the recipient area after hair transplantation, in which thirteen patients (38.2%) show changing the hair color from white to gray, while eleven patients (32.3) show changing the hair color from gray to black and seventh patients (20.5%) show changing the hair color from white to black. While three participants (8.8%) show no changing of hair color in the recipient area after hair transplantation (Table 2).

Table (1): Characteristics of the participants

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>No. (%)</th>
<th>Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total patients</td>
<td>34 (100%)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>34 (100%)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>(52 ± 5) years</td>
<td></td>
</tr>
<tr>
<td>Smoking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoker</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Ex-smoker</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Non-smoker</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Residency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Duration of baldness</td>
<td>(33 ± 5) years</td>
<td></td>
</tr>
<tr>
<td>Total grafts number (Hair n.)</td>
<td>(6017 ± 854)</td>
<td></td>
</tr>
<tr>
<td>Density (grafts\cm2)</td>
<td>40-60%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(51% ± 0.05%)</td>
<td></td>
</tr>
</tbody>
</table>

Table (2): Percentage of patients show hair color restoration in the recipient area after hair transplantation

<table>
<thead>
<tr>
<th>Patients Grade of Color Restoration</th>
<th>Numbers</th>
<th>Percentages (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative (changing from black color to gray or white color)</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Failure (no changing in color)</td>
<td>3</td>
<td>8.8%</td>
</tr>
<tr>
<td>Moderate (changing from white into gray color)</td>
<td>13</td>
<td>38.2%</td>
</tr>
<tr>
<td>Good (changing from gray into black color)</td>
<td>11</td>
<td>32.3%</td>
</tr>
<tr>
<td>Excellent (changing from white into black color)</td>
<td>7</td>
<td>20.5%</td>
</tr>
<tr>
<td>Total</td>
<td>34</td>
<td>100%</td>
</tr>
</tbody>
</table>
Regarding the percentage of hair follicles show change in their original color among transplanted follicles in the recipient area after hair transplantation, five patients (14.7%) show excellent restoration of hair color in which (76-99%) of the follicles show positive change in their color, eleven patients (32.3%) show good restoration of hair color in which (51-75%) of the follicles show positive change in their color, eight patients (23.5%) show moderate restoration of hair color in which (26-50%) of the follicles show positive change in their color, seventh patients (20.5%) show mild restoration of hair color in which (1-25%) of the follicles show positive change in their color, while three patients (8.8%) show failure in restoration of hair color in which (0%) of the follicles show positive change in their color (Table 3).

<table>
<thead>
<tr>
<th>Follicles Grade of Color Restoration</th>
<th>Numbers</th>
<th>Percentages (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative Change</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Failure = 0 % follicles</td>
<td>3</td>
<td>8.8%</td>
</tr>
<tr>
<td>Mild = 1-25 % follicles</td>
<td>7</td>
<td>20.5%</td>
</tr>
<tr>
<td>Moderate = 26-50 % follicles</td>
<td>8</td>
<td>23.5%</td>
</tr>
<tr>
<td>Good = 51-75 % follicles</td>
<td>11</td>
<td>32.3%</td>
</tr>
<tr>
<td>Excellent = 76-99 % follicles</td>
<td>5</td>
<td>14.7%</td>
</tr>
<tr>
<td>Perfect = 100 % follicles</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Total</td>
<td>34</td>
<td>100%</td>
</tr>
</tbody>
</table>

The degree of hair color restoration among transplanted follicles in the recipient area has been determined for each patients, however the mean for this changes for all participants show that (20%) of the hair follicles show change in their original color from white color to gray color when transplanted from the donor area to the recipient site, while (17%) of the hair follicles show change in their original color from gray color to black color, (7%) of the hair follicles show change in their original color from white color to black color, while (56%) of the hair follicles preserve their original color when transplanted from the donor area to the recipient site (Figure 1).

The comparison of hair color between the donor area before transplantation and recipient area after transplantation show significant increase in the percentage of black hair in the recipient area in compare to the donor area. Also, greater positive results regarding the percentage of gray hair in the recipient area in compare to the donor area. While the percentage of white hair show significant reduction in in the recipient area in compare to the donor area (Figure 2-4).

The patient’s satisfaction score at the end of the follow up period show statistically significant difference in the hair color between the donor area and the recipient area, in which most of the patients were highly satisfied and noticed a remarkable difference regarding the degree of hair color repigmentation among the transplanted follicles in the recipient area (Table 4).

Figure 1: Degree of color restoration among transplanted follicles in the recipient area.
Figure 2: Comparison of hair color between donor area and recipient area. 

(A) Comparison of the black hair color area percentage between donor area and recipient area.

(B) Comparison of the gray hair color area percentage between donor area and recipient area.

(C) Comparison of the white hair color area percentage between donor area and recipient area.

Figure 3. A Forty-five years old male before hair transplantation (A) and after 6 months of the operation show majority of white and gray hair transplanted from donor area changed into black hair in the recipient area. [Copyright: ©2024 Albakaa et al.]
Table (4): The patient's satisfaction score concerning the degree of hair color restoration among transplanted follicles in the recipient area.

<table>
<thead>
<tr>
<th>Grade of Color Restoration</th>
<th>Numbers</th>
<th>Percentages (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 0 (completely unsatisfied)</td>
<td>2</td>
<td>5.9%</td>
</tr>
<tr>
<td>Grade 1 (1-25 % satisfaction)</td>
<td>5</td>
<td>14.7%</td>
</tr>
<tr>
<td>Grade 2 (26-50 % satisfaction)</td>
<td>7</td>
<td>20.6%</td>
</tr>
<tr>
<td>Grade 3 (51–75 % satisfaction)</td>
<td>12</td>
<td>35.3%</td>
</tr>
<tr>
<td>Grade 4 (76–99 % satisfaction)</td>
<td>6</td>
<td>17.6%</td>
</tr>
<tr>
<td>Grade 5 (complete satisfaction)</td>
<td>2</td>
<td>5.9%</td>
</tr>
<tr>
<td>Total</td>
<td>34</td>
<td>100%</td>
</tr>
</tbody>
</table>

DISCUSSION

Hair transplantation is a surgical procedure that involves transferring hair follicles from the donor site to the recipient site (which is a bald or thinning area of the body). The most common type of hair transplantation is called follicular unit extraction (FUE), although another technique called follicular unit transplantation (FUT) or strip harvesting that is less likely used nowadays.

FUE involves harvesting individual follicular units from the donor area using a small special punch tool. These units are then moving into the recipient site. FUE leaves small, round scars, and it does not require stitches. While during FUT, a strip of skin containing hair follicles is surgically removed from the donor area (those with denser hair in the back or side of the scalp). Then the site is sutured, and the strip is divided into individual follicular units, which are tiny groups of one to four hairs. These units are then transferred into the recipient site, where the surgeon creates tiny incisions to accommodate them. FUT leaves a linear scar make a FUE a favorable procedure for patients as the scars are more cosmetically acceptable.

After the procedure, the transplanted hair will initially fall out, but within a few months a new hair growth should begin. The final results of a hair transplant can usually be seen within nine to twelve months. It's important to know that hair transplantation may not be suitable for every patient. Many factors such as the individual's overall health, the extent of hair loss and the quality and quantity of donor hair should be considered.

In this study we notice in some instances, there may be a noticeable difference in hair color between the transplanted and native hair. This occurs especially in patients with gray or white hairs in the donor area, as the transplanted hair follicles undergo marked

Figure 4. A Fifty-three years old male before hair transplantation (A) and after 1 years of the operation show majority of white and gray hair transplanted from donor area changed into black hair in the recipient area. [Copyright: ©2024 Albakaa et al.]
changing in their color with restoration of their original black color or darkening of the gray hair after their regrowth in the recipient site, we think these phenomena occur due to restoration of melanin production or changes in the hair cycle that occur due to various stimulants that release during wound healing of slits after hair transplantation that trigger melanin production and promote hair pigmentation. For our knowledge this is the first study that detect this phenomenon after hair transplantation and will inspiring the development of new therapies and techniques that can reversing the white and gray hair into their original black color.

Sun, Q et al study (Nature 2023) that concentrated on melanocyte stem cells in the mice, which are also present in humans and are responsible for the production of melanin, the pigment that gives hair, skin, and eyes its color. Melanocyte stem cells may ultimately cease to migrate as hair ages, and it is possible that they will be unable to access the stage of the process responsible for pigment production and hair color development. In this study the authors found that these cells will accumulate in the hair bulge. This results in the inability of the cells to mature and retain hair pigment, which causes the hair to turn gray, silver, or similar shades. The researchers established in this new study that graying can be prevented by relocating melanocyte stem cells to their correct location, where they continue to mature and produce pigment, after demonstrating that this accumulation of these cells have been occurred in the bulge area of the hair follicles. This newly discovered mechanisms suggest that human melanocyte stem cells may also be immobile in position as the hair ages. In this case, it could potentially serve as a means to reverse or prevent the graying of human hair by facilitating the re-migration of stuck cells between compartments of developing hair follicles.

Dinh, H. V. et al (2007) publish a case report of a 57-year-old Australian woman experienced repigmentation of white donor hairs after nine months following hair transplantation to treat an area of frontal scarring alopecia that had been present since infancy, the hairs have remained repigmented. Along the follow up period since the transplant more than two years ago.

Feng et al. study (2023) that report different cases of gray hair repigmentation and the possible mechanisms underlying these cases, that including using of different drugs like (Monoclonal antibody drugs, tyrosine kinase inhibitors, Immunomodulatory drugs, Immunosuppressant drugs and other drugs), also mechanical stimulation due to microinjuries and tumors like scalp melanoma and lung cancer in all these cases the author report the mechanism that led to hair repigmentation.

Hasegawa et al. (2021) report a repigmentation of aging gray hair that have been associated with development and progression of scalp amelanotic melanoma. The authors discuss the pathophysiological mechanism underlying this phenomenon and the importance of it regarding hair rejuvenation in the future. Yale et al. (2019) and Correa-Selm, L. M. et al. (2017) report a group of medications that can induced gray hair repigmentation and the possible mechanisms underlying this evidence and the significant of it for future development of special drugs for hair repigmentation.

Goren et al. (2016) publish a case report of 50 years old male with more than 50% of the scalp hair exhibiting grey hair. In this case a 1 cm² area on the scalp with significantly grey hair was shaved and 20 hair follicles were harvested from occipital scalp using the FUE technique. Hair follicles were incubated for 90 min to separate the outer root sheath cells then the suspension was filtered and centrifuged for 5 min to obtain a cell pellet which was injected to the recipient area. After one-month follow-up period, a significant hair follicles repigmentation was clinically observed in the area.

There are many case reports regarding different inflammatory skin conditions that have been associated with grey hair repigmentation in the areas of inflammation. These conditions reflect the possible role of inflammatory mediators in the process of stimulation of melanin synthesis in the hair roots of grey hairs.

Hair repigmentation in the recipient area is a newly detected phenomena after hair transplantation surgery and to our knowledge this is the first study published regarding this phenomenon till now, detecting this phenomenon and understanding the pathophysiological mechanisms that involved in hair follicle melanogenesis is fundamental in developing potential therapies to reverse grey hair. However, for achieving this objective, it requires extensive efforts by investigators to achieve safe and effective medications and/or physical therapies that have the ability to stimulate melanin synthesis in the hair roots to re-pigment the gray hair.
CONCLUSION

Hair repigmentation in the recipient area is a newly detected phenomena after hair transplantation surgery. Most patients with white or gray hair in the donor area show regain their original blackish color of their hair follicles in the recipient area after hair transplantation. We think that detecting this phenomenon will give us insight about how we can restore the original color of our white or gray hair by understanding the mechanism of how the melanocytes within the hair root regain their ability of melanin production after hair transplantation.

REFERENCES