



An international expert consensus statement focusing on pre and post hair transplantation care

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ARTICLE



An international expert consensus statement focusing on pre and post hair transplantation care

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ABSTRACT

Aim: To achieve international expert consensus and give recommendations on best practices in hair transplantation surgery, focusing on pre- and post-transplantation care.

Methods: A modified Delphi method was used to reach consensus. An international scientific committee developed an 81-statement questionnaire. A panel of 38 experts in hair transplantation from 17 countries across 4 continents assessed the questionnaire.

Results: Two consensus rounds were carried out, with 59 out of 81 statements (73%) reaching consensus. Expert recommendations emphasize the correct selection of candidates for hair transplantation and the need for patients to have received adequate medical treatment for alopecia before transplant. Comorbidities should be assessed and considered while planning surgery, and an individualized plan for perioperative care should be drawn up before transplant. Certain medications associated with increased risk of bleeding should be withdrawn before surgery. Specific recommendations for post-transplantation care are given. After transplantation, patients should gradually resume their normal haircare regimen. Close follow-up should be carried out during the first year after transplant.

Conclusions: This study presents numerous consensus-based recommendations on general aspects of hair transplantation, including candidate selection, medical therapy prior to transplantation, anesthesia, and resuming haircare after transplantation.

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Hair transplantation; preoperative care; postoperative care; best practice



Introduction

Hair restoration surgery is a growing field of medical expertise, with over 700,000 hair transplants performed worldwide in 2021 and an increasing number of physicians carrying out the procedure (1). Since the first hair transplantation in 1931, the procedure has evolved rapidly, with surgical techniques being refined constantly to optimize esthetic results and reduce the risk of complications.


The most common indication for hair transplantation is androgenic alopecia (2), although certain candidates with noninflammatory secondary scarring alopecia have been successfully treated with hair transplantation (3). Patients with primary scarring alopecia are usually unsuitable candidates, although some patients with stable inflammatory scalp conditions have undergone hair transplant with satisfactory results (4,5). It is important to individualize the indication for hair transplantation on a case-by-case basis. Physicians carrying out the procedure must ensure that patients have realistic expectations about the results and are aware of the possible complications that the procedure entails.

Since its first description at the beginning of the twenty first century, follicular unit excision has widely replaced strip follicular unit transplantation as the most common donor harvesting technique, due to the absence of sutures and linear scars which make the former alternative more attractive, although more labor-intensive. Grafts can be stored in a variety of holding solutions, and in some cases are chilled after harvesting. The procedure is usually carried out under local anesthesia and sometimes with superficial sedation, with patients being discharged the same day. A series of recommendations for the correct care of the donor and recipient sites are given to the patients after surgery.

Despite its growing popularity, there are many aspects of hair transplantation which are still topics of debate among experts (3). The objective of this study was to review available scientific evidence and achieve international expert consensus on best practices in hair transplantation for physicians in the field, focusing on pre- and post-transplant care.

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Material and methods

A modified Delphi method was used to obtain consensus on best practices in hair transplantation, focusing on pre- and post-transplantation care. An international scientific committee consisting of 7 experts in hair transplantation with more than 10 years of clinical practice and other recognized experts with substantial experience in hair transplantation was appointed to develop a questionnaire. Items on the questionnaire were drawn from an extensive qualitative literature review conducted in April 2022, including articles published in English over the last ten years. Databases included in the literature review included Medline (via PubMed), Embase, The Cochrane Library, MedEs, Epistemonikos, Joanna Briggs Institute Evidence Based Practice Database, and Tripdatabase. Keywords used included 'hair transplantation', 'hair restoration surgery', 'guidelines', 'preoperative care', and 'postoperative care'.

The scientific committee selected a panel of 38 different experts from 18 countries across 4 continents (Germany, Spain, France, Israel, United States of America, Brazil, Paraguay, United Kingdom, Poland, Turkey, Italy, Russia, Panama, Chile, Dominican Republic, Belgium, Ukraine, and Mexico), with 36 panelists participating in both consensus rounds. All panelists had more than 5 years' experience in hair transplantation, and preferably belonged to a scientific committee or expert working group on trichology or hair restoration surgery.

The questionnaire was published using a secure online platform in June 2021. Two consensus rounds were carried out, taking place between June 20th to July 26th, 2021, and August 22nd to September 19th, 2021, respectively. Each statement was assessed using a single 9-point Likert-type ordinal scale, where 1 stood for full disagreement, and 9 signified full agreement. Responses were classified into three groups: a score of 1–3 was considered as disagreement, 4–6 as neither agreement nor disagreement, and 7–9 as agreement. Consensus was reached if 1) the median of the responses was in the 7–9 (agreement) or 1–3 (disagreement) range, 2) less than one-third of the panelists voted outside these ranges and 3) the interquartile range (IQR) was less than 4. The scientific committee had access to the data from the first round and an interim statistical analysis was carried out between rounds. Panelists were also able to review results from the first round, after which all items failing to reach consensus were evaluated during a second round. A final meeting took place on October 10th, 2022, to discuss the results, during which the scientific committee rephrased and issued some recommendations on several of the statements which had failed to achieve consensus on the second round, considering their clinical experience and the available evidence from the scientific literature. The results were presented as tables featuring the different recommendations; detailed results are included as [supplementary material \(Appendix 2, Tables S1–S4\)](#)

Results

On the first round, 55 out of the 81 statements (68%) reached consensus, while during the final round, 59 out of 81 statements (73%) reached consensus ([Tables S1–S4](#)), with 36 panelists participating in both rounds.

Recommendations on pre-transplantation care

Recommendations on pre-transplantation care are summarized in [Table 1](#). Statements on the role of specific nutritional supplements as adjuvant therapies during the pre-transplantation period, as

well as novel procedures such as low-level light therapy (LLLT) and mesotherapy, did not achieve consensus. Likewise, no recommendation on the use of caffeinated drinks on the day of surgery was made due to lack of consensus.

Recommendations on medical care during the hair transplant procedure

Regarding statements on graft preparation and conservation, consensus-based recommendations included storage of grafts in extracellular holding solutions such as normal saline or Ringer's Lactate, or in intracellular holding solutions such as Hypothermosol®, Collins or Custodiol® - HTK if surgery will take more than 6–8 h. If intracellular holding solutions are used, grafts should be chilled at 2–8°C. Grafts that are harvested more than 6–8 h before transplantation should be chilled at 2–8°C. No consensus was achieved regarding the storage of grafts in autologous plasma.

Recommendations on general medical care and medication during hair transplantation are summarized in [Table 2](#). No consensus was reached on the use of intraoperative LLLT or mesotherapy.

Recommendations on post-transplantation care

A summary of recommendations made on post-transplantation care can be found in [Table 3](#). Consensus-based recommendations on post-transplantation follow-up and evaluation confirmed the importance of patient assessment on the days following hair transplant to rule out possible complications, and the need for close follow-up through regular appointments during the first year after hair transplantation surgery.

Discussion

In this study, an international group of experts on hair transplantation have achieved consensus on various aspects of best practice in hair restoration surgery, focusing on pre- and post-transplantation care. Our research presents numerous recommendations for physicians in the field of hair transplantation to help standardize care in this growing area of medical expertise, to improve patient safety, and to optimize clinical results.

Although increasingly popular amongst patients seeking treatment for hair loss, hair transplantation is not an appropriate option for all candidates. The correct selection of patients for hair transplant is an essential part of the procedure's success, with important ethical and even legal implications (6,7). Physicians should ensure that patients have realistic expectations regarding results, and must inform patients of possible complications, eliciting written informed consent before the procedure. While the role of hair restoration surgery as a successful treatment for patients with androgenetic alopecia has been confirmed by multiple studies (8,9), patients with forms of primary cicatricial alopecia have traditionally been considered as poor candidates for hair transplantation. However, several case reports of successful hair transplant in patients with these conditions (10–13) and advances in surgical technique and physician expertise support consideration of these patients for hair transplant on a case-by-case basis, after ruling out the presence of inflammatory activity.

The need for adequate medical treatment of alopecia before and after transplant is crucial to prevent or slow deterioration of the non-transplanted hair. This recommendation is especially

Table 1. Consensus recommendations on pre-transplantation care.**1.1 Recommendations on specific treatments in preparation for hair transplantation**

Medical therapy (Finasteride/Dutasteride and Minoxidil) should be prescribed in hair transplant patients with androgenetic alopecia (Norwood Hamilton grades I-V) to avoid deterioration of the non-transplanted hair.

In young patients (<30years) with androgenetic alopecia consulting for hair transplant evaluation, adequate medical therapy should be recommended (Finasteride/Dutasteride and Minoxidil) at least 6 months before the hair transplant, to confirm the stabilization of their alopecia

Low dose oral minoxidil (0.25–5mg) may be considered during the pretransplant period especially in female hair transplant candidates with androgenetic alopecia.

Patients considering hair transplantation should undergo trichoscopy to exclude subtle forms of cicatricial alopecia and non-focal forms of alopecia areata.

Patients with inflammatory scalp conditions such as psoriasis should have received specific treatment and show no signs of inflammatory activity at the time of transplantation.

Patients with inflammatory scalp conditions such as psoriasis should be warned that their condition may worsen transiently after hair transplant.

Patients with cicatricial alopecia should be stabilized before performing the hair transplant and a careful discussion with the patient about the expected result is needed.

Patients with a history of alopecia areata should not have clinical and trichoscopic signs of activity before the procedure and must be informed about the possibility of relapse at any time.

Topical ketoconazole may be considered in hair transplant candidates as an adjuvant therapy before hair transplant.

Specific anti-hair loss products such as shampoo, conditioner and hair lotions proving efficacy and safety in ex-vivo and clinical studies could be an option in hair transplant candidates as an adjuvant therapy before hair transplant, considering their cosmetic results. *

1.2 Recommendations on discontinuing medical treatment before hair transplantation

Antiandrogenic treatment (finasteride, dutasteride, bicalutamide, spironolactone, and contraceptives) should not be stopped before hair transplant.

Topical minoxidil (2–5%) and aminexil should be stopped 7 days before surgery to minimize risk of skin irritation and the potential risk of increased intraoperative bleeding secondary to vasodilation.

Anticoagulants should be stopped 72 to 96 h before hair transplantation after approval from the patient's primary care physician or specialist doctor.

Antiaggregant therapy with clopidogrel should be stopped 72 to 96 h before hair transplantation if approval from the patient's primary care physician or specialist doctor is obtained.

Antiaggregant therapy with low-dose aspirin should not be stopped before hair transplantation.

Anti-inflammatory drugs (ibuprofen, diclofenac, etc.) should be stopped 1 week before transplant.

Vitamin supplements should be stopped 1 week before hair transplant since some vitamin supplements such as Vitamin E can potentially increase risk of bleeding during transplant.

Antihypertensive medication should not be stopped before hair transplantation.

1.3 Recommendations on other aspects of pre-transplantation care

Consumption of tobacco, alcohol and recreational drugs should be stopped 3 days before the surgery to increase the chances of a successful transplant and reduce risk of interaction with anesthesia and other medication given during surgery.

The use of sprays, gels, wax, and other hair styling products should be stopped 24 h before hair transplantation.

Patients should not dye their hair during the 3–4 days preceding hair transplantation. *

Patients should wash their hair thoroughly before hair transplantation.

A blood test with serologies (HBV, HCV, HIV), coagulation and complete blood count should be ordered before hair transplantation.

The patient should fast for at least 6 h before the hair transplant if superficial intravenous sedation is used.

Fasting is not required before the hair transplant if the patient does not undergo light intravenous sedation.

Patients should complete a preoperative questionnaire with information about current medication, drug allergies, skin allergies (latex, alcohol, etc.) and any existing comorbidities.

Patients should be informed about possible side effects of hair transplantation and written informed consent should be obtained.

Common complications of hair transplant include scabs, erythema, pruritus, pain, folliculitis, post-operative effluvium, and frontal swelling.

Serious although rare complications of hair transplant include cyst formation, scarring, cheloids, scalp infection, bleeding, and necrosis.

*Recommendation of the scientific committee members.

Table 2. Consensus recommendations on medical care during hair transplantation.

The presence of an anesthesiologist should be considered during hair transplant for a selected group of patients (patients with comorbid conditions, high anesthetic risk, etc.)

In patients with hypertension, blood pressure should be controlled before and during surgery.

Patients should be treated with local anesthesia during hair transplantation.

Superficial intravenous sedation may be considered for patients undergoing hair transplantation.

Patients with risk factors for infective endocarditis should receive antibiotic prophylaxis with systemic antibiotics during hair transplantation after consulting with an infectious disease specialist.

An emergency 'resuscitation cart' should be available in case of emergency and staff performing the procedure should have basic training in cardiopulmonary resuscitation.

Triamcinolone may be added to the local anesthesia of the recipient site to minimize frontal swelling

important for younger patients (less than 30years) with androgenetic alopecia considering hair restoration surgery, who should be given at least 6 months' treatment with standard medical therapy to confirm the stabilization of their alopecia. Current options for androgenetic alopecia include oral antiandrogenic therapy (5- α -reductase inhibitors, bicalutamide, spironolactone and oral contraceptives) and oral or topical minoxidil as mainstays of medical treatment (14–16). It is important to rule out common causes of inflammation in patients suffering from hair loss, such as dandruff/seborrheic dermatitis, and treat these causes with approved therapies such as topical ketoconazole prior to transplantation. Other new therapies such as topical finasteride, mesotherapy with

antiandrogens, platelet-rich plasma (PRP) and low-level light therapy (LLLT) may be useful as adjuvant treatments prior to transplantation.

Novel procedures such as LLLT or mesotherapy with PRP are becoming increasingly popular as adjuvant treatments for different types of alopecia (17–24), with some experimental and clinical studies supporting their role in slowing hair loss and promoting hair regrowth. The anti-inflammatory properties of PRP could confer a potential post-operative benefit (25,26); however, further investigation is needed to confirm the benefits of these techniques in the context of hair transplantation. The use of specific products such as shampoos, conditioners, and lotions

Table 3. Consensus recommendations on post-transplantation care.**3.1 Recommendations on post-transplantation treatment**

Patients should be prescribed post-transplant analgesia with NSAIDs or paracetamol.

Cold compresses or ice should be used to avoid or improve frontal swelling during the first week after transplant.

Post-transplant prophylaxis with oral antibiotics may be considered for patients undergoing hair transplant if clinically indicated.

Post-transplant prophylaxis with topical antibiotics to prevent folliculitis is not usually necessary for patients undergoing hair transplant. *

Patients may continue their habitual treatment, including anticoagulants, antiaggregant therapy, vitamin supplements etc. 24-48 h after hair transplant.

Antihistamines may be continued 24-48 h after hair transplantation.

Oral or intramuscular corticosteroids may be administered to reduce frontal swelling after hair transplant.

A specific lotion for slowing down hair loss and stimulating hair growth with proven efficacy shown in clinical studies may be considered as an option after hair transplant, especially for non-transplanted areas. *

A specific lotion proving efficacy and safety in ex-vivo and clinical studies may be considered as an option after transplant to reduce inflammation and aid graft adhesion. *

PRP may be considered after transplant to reduce post-surgical inflammation. *

3.2 Recommendations on resuming hair care after transplantation

Non-absorbable stitches should be removed between 10-14 days after the hair transplant (strip technique).

Patients should maintain the recipient area humid by spraying the area with water or normal saline every 2-3 h during the first 2-3 days after transplant.

Patients may start washing their hair gently, without rubbing the scalp, 24 h after the hair transplant.

A gradual approach over two weeks, from a 'no contact wash' to a 'normal washing technique', should be used after hair transplant.

Patients should wait for two weeks to one month before immersing their heads in water (including swimming pools). *

Patients should start rubbing the scalp to eliminate the crusts from the donor area 5-7 days after transplant.

Patients should avoid applying pressure on the recipient area during the first two weeks after hair transplant

Patients should wash the donor area daily with water and a neutral shampoo during the first week after transplant

Patients should wait for a week after transplant before brushing their hair.

Patients should wait for two weeks before using gels, creams, waxes, and other hair styling products.

Patients should wait a month after hair transplant before cutting or dyeing their hair.

A loose-fitting cap or hat may be worn immediately after surgery.

Patients should avoid exposure to direct sunlight in the recipient and donor areas during at least one month after transplant.

Patients should avoid sport or physical activity during the first week after hair transplant (to avoid possible trauma of the recipient zone).

*Recommendation of the scientific committee members.

– preferentially those which have demonstrated safety and efficacy in preclinical and clinical trials – may be considered as adjuvant therapies, especially taking into account their cosmetic effects (27–30). Specific lotions for slowing down hair loss and stimulating hair growth with proven efficacy shown in clinical studies may be considered as an option after hair transplant, especially for non-transplanted areas, while lotions proving efficacy and safety in ex-vivo and clinical studies may be considered in the post-transplantation period to reduce inflammation and aid graft adhesion (28).

Patient safety during hair transplantation surgery is a priority, and our study recommends several measures to reduce peri-operative risk. Although normally unnecessary, the presence of an anesthesiologist should be considered in certain patients with high operative risk. Close coordination with patients' primary care or specialist physicians can facilitate the modification of patients' habitual treatment before and after transplant, or the prescription of antibiotic prophylaxis where risk of infective endocarditis is a concern. Severe bleeding is a rare but potentially serious complication of hair transplant (31), and patients undergoing treatment with anticoagulants or antiaggregant such as clopidogrel should suspend medication to mitigate this risk (32). However, treatment with low-dose aspirin is considered as posing a negligible risk for bleeding during even major surgery and need not be stopped before hair transplantation (33). Certain medications used to treat alopecia, such as topical minoxidil and vitamin supplements, should also be discontinued before surgery, as they have been associated with scalp irritation, vasodilatation, and anti-platelet activity (34–36). However, no evidence is available on whether oral minoxidil increases risk of bleeding during hair restoration surgery, and further studies are needed to confirm

whether oral minoxidil may be continued during the immediate pre-transplantation period.

The consumption of tobacco, alcohol and recreational drugs should be discontinued 3 days before surgery to increase the chances of a successful transplant and to reduce the risk of interaction with anesthesia and other medications administered during surgery. It is unclear as to whether caffeinated drinks should be allowed on the day of transplant itself; reasons to permit caffeinated drinks before hair transplantation include reducing the risk of postoperative headache and anxiety associated with caffeine withdrawal (37). On the other hand, caffeinated drinks may lead to increased diuresis, complicating the procedure (37,38).

The use of local anesthesia is the current standard of care in hair transplantation, although our study suggests that the use of superficial intravenous sedation may be considered for certain patients (for example, in those with higher levels of anxiety (39)), in which case patients should fast for six hours before the procedure. The use of topical antibiotics as prophylaxis for folliculitis is controversial (40,41), and although no consensus was achieved, the scientific committee recommends that, although prophylaxis with topical antibiotics may be considered, it is usually unnecessary. Intramuscular or oral corticosteroids, ice compresses and oral analgesia with paracetamol or non-steroidal anti-inflammatory drugs are the mainstay of post-transplantation care to reduce frontal swelling and post-operative pain.

While aspects of surgical technique are outside the scope of this study, some consensus was achieved on the topic of holding solutions to be used for graft preservation before transplantation. Panelists agreed that extracellular holding solutions, such as normal saline or Ringer's Lactate, can be used, and that for grafts stored for more than 6–8 h after harvesting, intracellular holding

solutions such as HypoThermosol®, Collins, or Custodiol® HTK may be considered. Although lower temperatures improve survival of some bodily tissues, at present there is no conclusive evidence to support chilling grafts during hair transplantation (42). However, panelists agreed that for hair grafts stored in intracellular holding solutions or those harvested more than 6–8h before transplantation, chilling at 2°C–8°C should be recommended. While plasma has been mentioned in the scientific literature as an effective holding solution (43), larger trials are required, and no consensus was reached regarding its use.

After transplant, patients should resume their normal haircare regimen gradually, as the recipient area is very vulnerable; exposure to pressure and direct sunlight should be avoided, especially during the 2–4 first weeks after transplant. Optimal care of the recipient site during the first days after hair transplant includes ensuring that the area is kept moist by regularly spraying it with water or saline solution, while gentle scalp-rubbing of the donor site is recommended from days 5–7 after transplant in order to remove scabs. Nutritional deficiencies, including low serum levels of some trace elements such as zinc and copper, have been associated with hair loss, and as such the scientific committee recommends that specific nutritional supplements (including antioxidants, sulfur amino acids, vitamins, iron, and zinc) may be considered after transplantation if the physician considers that the patient may benefit from treatment (28, 44). Patients should be assessed for possible complications during the days following hair transplantation and should be seen at regular appointments for close follow-up during the first year after surgery.

The limitations of our consensus are those inherent to the Delphi method. A notable disadvantage of this method is the lack of in-depth discussion of recommendations with all participating panelists. However, panelists were able to provide feedback on the different statements during both rounds, and the scientific committee took this feedback into account when drafting the tables and recommendations for best practice in hair transplantation. Another limitation of the study is the relatively high percentage of statements failing to achieve consensus; we hypothesize that this is probably due to the level of recommendation used when formulating statements for the questionnaire. Due to the relevance of some of these statements for clinical practice, the members of the scientific committee decided to rephrase and include various statements which did not reach consensus in the second round as recommendations based on the available scientific evidence and their own substantial clinical experience.

Conclusions

The need for common standards for best practice in hair transplantation surgery is growing, due to the increasing popularity of the procedure. This study aims to aid clinicians in the field of hair transplantation with recommendations by a panel of international experts on common aspects of pre- and post-transplant care. Our study concludes that the correct selection of candidates for hair transplantation is essential; physicians should assess patients' expectations carefully, rule out active inflammatory scalp conditions, provide information on possible complications, and obtain patients' written informed consent. Patients should receive standard medical treatment for alopecia before transplant, while procedures such as LLLT, mesotherapy, and the use of specific shampoos and lotions may be considered. Comorbidities should be assessed and considered while planning surgery, and an individualized plan for anesthesia and antibiotic prophylaxis should be

drawn up before transplant. While most medication need not be discontinued before hair transplant, certain drugs associated with increased risk of bleeding - such as anticoagulants, clopidogrel, vitamin supplements and topical minoxidil - should be withdrawn before surgery.

Specific recommendations for post-transplantation care include the use of oral analgesia with NSAIDs and paracetamol and the application of ice or cold compresses to reduce frontal swelling, while oral or intramuscular corticosteroids may also be considered. Patients should resume their normal hair care regimen (including washing, brushing, dyeing, and styling) progressively. Exposure to sunlight should be avoided during the first month after transplant. The use of novel techniques such as mesotherapy with PRP and LLLT, and the administration of specific shampoos and lotions may be considered to reduce anti-inflammatory activity in the post-transplantation period and improve overall results, although more scientific research is necessary to confirm potential benefits.

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Disclosure statement

Dr. Sergio Vano-Galvan reports acting as an advisor for Lilly and Pfizer. He has received honoraria for lectures with Pierre Fabre, Cantabria Labs, Lilly, Pfizer and L'Oréal. Dr. Bessam Farjo reports activity as shareholder and director of HairClone Limited, a biotech company investigating cell therapy for hair loss. Dr. Christian N Bisanga, Dr. Pierre Bouhanna, Dr. Vincenzo Gambino, Dr. Teresa Meyer-González, and Dr. Tatiana Silyuk have nothing to disclose.

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Data availability

All data from the final round is included as [supplementary material](#); data from the first round is available from the authors upon request.

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