

UPDATES IN HAIR TRANSPLANTATION

ESSAY

Submitted in partial fulfillment for Msc Degree
In Dermatology, Andrology and STDs

By

Nancy Esam Eldin Ghonam Ahmed

M.B., B.Ch.

Supervisors

Prof. Dr. Mohamed Abd El Meneem Abd Alaal

Professor Dermatology, Andrology and STDS Department,
Faculty of Medicine, ALAzhar University

Prof. Dr. Taymour Mohamed Khalifa ELTonisy

Professor Dermatology, Andrology and STDS Department,
Faculty of Medicine, ALAzhar University

Faculty of Medicine, ALAzhar University

2012

Acknowledgement

*" First and Foremost, Thanks are Due to GOD
The Most Beneficent, The Most Merciful"*

I would like to express my profound gratitude and appreciation to professor of dermatology Dr. Mohamed Abd El Meneem Abd Alaal for his valuable supervision and advice.

I would like also to express my deep thanks and gratitude to professor of dermatology Dr. Taymour Mohamed Khalifa El Tonisy for his valuable suggestions and continuous advice, encouragement and support.

Finally, I thank my family, my professors and my colleagues for their help and support.

Nancy Esam Eldin Ghonam Ahmed

Table of contents

1. Table of contents.....	I
2. List of abbreviations	III
3. List of tables.....	V
4. List of figures.....	VI
5. Introduction	1
6. Concept of hair transplantation.....	4
7. History of hair transplantation.....	6
8. Path physiology and Classification.....	10
Nonsurgical Treatment Options.....	19
9. Preoperative consultation.....	20
Patient selection.....	24
Patient expectations.....	27
10. Preoperative Preparation.....	29
Preoperative Instructions.....	29
Patient evaluation.....	35
Surgical planning.....	36
11. Operative Techniques.....	53
The operating room.....	54
Techniques.....	58
Conclusion.....	98
Hair transplants in special sites.....	118
Comparison between FUE and FUT.....	123
12. Postoperative care.....	127
13. Complications and their management.....	130

14. Future Trends.....	142
15. Summary.....	144
16. References.....	146.
17. Arabic summary.....	1-2

List of abbreviations

AA	Anatomic apex
AGA	Androgenetic alopecia
BHT	Body hair transplantation
CAG	Coronal angle grafting
CC	Cubic Centimeters
Cm	Centimeter
DHT	Dihydrotestosterone
DPA	Diffuse Patterned Alopecia
EMS	Emergency medical services
FCI	Follicular Cell Implantation
FDA	Food and Drug Administration
Fig.	Figure
FPLE	Female pattern of hair loss
FT	Follicular transfer
FU	Follicular Unit
FUE	Follicular Unit Extraction
FUSE	Follicular Unit separation Extraction
FUSS	Follicular Unit separation strip
FUT	Follicular unit Transplantation
g	Gauge
HIV	Human Immunodeficiency Virus
HT	Hair transfer

LA	Lateral angle
Kg	Kilogram
MFP	Mid frontal point
mg	Milligram
ml	Milliliter
mm	Millimeter
MPB	Male pattern baldness
MPHL	Male pattern of hair loss
PRP	Platelet-rich-plasma
SAG	Sagital angle grafting
SEBL	supra-eyebrow line
VLC	Vertical lateral canthal line

List of tables

Table	Title	Page
Table 1	Classification of Androgenetic Alopecia	14
Table 2	Non-Androgenetic Causes of Diffuse Hair Loss in Women	16
Table 3	Patient Selection in the Surgical Treatment of Androgenetic Alopecia	25
Table 4	Preoperative instructions for patient	31-33
Table 5	Elements of the Consent Form for Hair Transplantation	34
Table 6	Suggested equipments needed for typical hair restoration procedure	53,54
Table 7	The advantages and disadvantages of Follicular Unit Extraction	125,126
Table 8	Summarizes typical post-operative instructions following follicular unit transplantation	129
Table 9	Problems Encountered in Follicular Unit Hair Transplantation and their Management	130-133
Table 10	Complications of hair transplantation	133

List of figures

Figure	Title	page
Fig. 1	Occipital line scar related to strip surgery hair transplant harvest technique	5
Fig. 2	Donor area after FUE hair transplant after 7 days	5
Fig.3	Punch hair grafts measuring 4, 3, and 2 mm	7
Fig.4	Mini-micrografting Technique. Harvesting with a multi-bladed knife, and division into smaller sections of approximate 1-cm	8
Fig.5	Dermoscopic aspects in diffuse alopecia	12
Fig.6	Norwood Classification	13
Fig.7	Ludwig scale for female pattern hair loss	15
Fig.8	A patient who underwent transplantation at 20 years of age with 4-mm punch grafts along the frontal hairline	26
Fig.9	Example of enlarging bald spot around a vertex transplanted with large plugs	37
Fig.10	Major zones and landmarks. The three transplantable zones are the frontal region, mid-scalp, and vertex.	37
Fig.11	The frontal hairline is designed by placing the MFP 7–11 cm above an imaginary line drawn horizontally across the glabella.	38
Fig.12	Creating a lateral hump in a lowered temporoparietal fringe allows the frontal hairline to be kept in a natural alignment	39
Fig.13	Frontal Hairline Patterns. There are four basic patterns of the nonbalding male frontal hairline	40
Fig.14	The following 3 basic rules should be observed to ensure a natural-looking hairline	41
Fig.15	Anatomic Landmarks.	42

Fig.16	Steps in Hairline Design	43
Fig.17	Latest model of a handheld laser device	44
Fig.18	Drawing a male hairline	45
Fig.19	A typical frontal hair line has been drawn on with the intent of limiting transplantation to the vertex transition point.	46
Fig.20	(a) A female with familial high frontotemporal recessions that desires a more rounded feminine hairline. (b) After the hairline has been lowered with transplants into a more feminine position.	47
Fig.21	Frontal hair line design of female	48
Fig.22.	Drawing a female hairline.	49
Fig.23	The donor area should be assessed on a case-by-case basis.	50
Fig.24	Green indicates “safe area” for harvesting donor ellipse. It is bordered inferiorly by the occipital protuberance and superiorly by a line drawn from the tops of the ears	51
Fig.25	Instruments to create sites	55
Fig.26	Autoclavable container to store jeweller’s forceps	56
Fig.27	Injection of anesthesia into the donor area.	59
Fig.28	Dissection at the tapered corner of the strip in a mid-subcutaneous plane, just below the follicles	62
Fig.29	Complete closure with staples	63
Fig.30	Suturing the donor area using absorbable sutures	63

Fig.31	Schematic of the suturing technique recommended for sewing the donor scalp. The spacing between loops is from 4.5 to 5 mm	64
Fig.32	Trichophytic closure	65
Fig.33	Close-up view of a donor strip showing the natural hair groupings at the surface	66
Fig.34	Slivering” the donor strip into sections	67
Fig.35	The first step is to divide the donor strip crosswise into smaller slivers containing 1 or 2 rows of follicular units	67
Fig.36	Stereo-microscopic dissection of one section into smaller pieces	68
Fig.37	The final step of the dissection: generating individual follicular units	68
Fig.38	The follicular grafts are placed in Petri dishes according to the number of hairs they contain and are kept hydrated until implantation	69
Fig.39	Graft cutting on a wood block	70
Fig.40	Dissected one-, two-, three- and four-hair follicular units	70
Fig.41	0.8 and 1 mm special micropunches	76
Fig.42	Indentation	77
Fig.43	Scoring	77
Fig.44	Extraction	78
Fig.45	Placing the grafts on a wet dressing material	78
Fig.46	FUE grafts containing 5 and 6 hairs	79
Fig.47	A sharp punch is inserted to a depth of 0.3–0.5 mm, followed by (b) the use of blunt punch insertion. (c) Finally, the follicular unit is then removed.	80

Fig.48	Microscopic view of grafts after FUE. Note that there is some loss of investing tissue around the follicles themselves.	82
Fig.49	a) Hollow-shafted micromotor hand piece used for powered follicular unit extraction. (b) Manual biopsy punch used in conventional follicular unit extraction	83
Fig.50	The automated FUE device is hand-held, with filter and vacuum suction attachment right by the hand piece with the filter housed in the cylinder shaped plastic capture container	84
Fig.51	The filter/capture device to store grafts during procedure.	84
Fig.52	NeoGraft FUE machine	85
Fig.53	<i>ARTAS Robotic FUE Imaging System</i>	86
Fig.54	The ARTAS Hair Restoration System	87
Fig.55	Before and immediately after implantation of the scalp during FUT	87
Fig.56	Donor area in FUE. (A) Immediately after harvesting 600 grafts. (B) Six days post-operative (C) 13 days later	89
Fig.57	Follicular unit extraction using harvested chest hair to treat a donor strip scar. Preoperative view compared with the 3-month postoperative result	90
Fig.58	. (A) Frontal view of the patient before FUE. (B) Side view of the patient before FUE. (C) Frontal view of the patient after FUE. (D) Side view of the patient after FUE	91
Fig.59	Hypodermic needles and rectangular blades used to make the recipient incisions.	92
Fig.60	Normal hair direction: A) top view, B) side view	94
Fig.61	Traditional orientation of sites for sagittal angle grafting and more recently the coronal angle grafting orientation	94

Fig.62	A, incisions along the hairline before the grafts are inserted. B, placement of the grafts with special ultrafine-tipped forceps	95
Fig.63	Staff using loop magnification and curved jeweler's forceps to place follicular unit grafts into pre-made recipient sites.	96
Fig.64	(A) Before and (D) 1 year after two sessions totaling 4295 follicular unit grafts. (B) Preoperative markings of the planned procedure. (C) First session just before placement, showing the distribution of 2355 recipient sites	99
Fig.65	A, patient with androgenic alopecia before follicular unit hair transplantation. B, result after the procedure	100
Fig.66	Pre-Hair Transplant	101
Fig.67	Post-HT of 1800 FUGs	101
Fig.68	(a) A male in his 20s has a hairline drawn on to show conservative placement. (b) After one session of 2,200 FUs	102
Fig.69	A) Pre-op of Early Norwood Class VI. B) One year after one session of 2520 follicular unit grafts	103
Fig.70	A) Pre-operative, Norwood Class VI, B) One year after two sessions of 2678 and 1836 follicular unit grafts	103
Fig.71	(a) Seventy-eight-year old male before first session showing extensive baldness. (b) After three sessions to the frontal scalp	104
Fig.72	A) Pre-op, Norwood Class V. B) Integrating hair with a persistent frontal forelock	105
Fig.73	Burn scars on the scalp are an excellent indication for transplantation	106
Fig.74	A. Before hair transplant, B. After 800 one to three hair grafts.	107
Fig.75	. (A) Before and (B, C) after a single procedure of 1800 grafts on a patient in his early 20s	108

Fig.76	(a) Photograph of a patient before his first hair transplant procedure, (b) This photo was taken 12 months after the second session of FUT	109
Fig.77	A) Pre-op showing large grafts forming a literal wall of plugs. B) Camouflage from one session of 1818 follicular units	110
Fig.78	(A) Before the procedure, (B) 2 weeks postprocedure, (C) 8 months postprocedure, (D) the FUT in process of removing follicular units from the donor site	111
Fig.79	(a) A patient before his first transplant at the office, (b) Eleven months after a session of 1,973 follicular units	111
Fig.80	(a) Typical FPHL showing hairline marked to indicate that grafts will be placed at the hairline and behind. (b) After one session of approximately 1,200 FUs and MFUs	113
Fig.81	(A) Before and (B) after a single procedure of 2300 grafts	113
Fig.82	A, receding frontal hairline. B, result a year after the procedure	114
Fig.83	(a) Before transplant: The black crayon marks delineate the area to be treated. (b) Nine months after a single session in which FUs	115
Fig.84	(a) Before treatment. (b) Twelve months after frontal hair transplant with 934 follicular units . (c) Before treatment, caudal view with the hair parted for critical evaluation. (d) Three and a half years after second follicular unit transplantation session . (e) Photo taken at the same time as the one shown in (d)	116
Fig.85	(a) Before first transplant. (b) Eight months after first follicular unit transplant (consisting of 1,573 follicular units)	117
Fig.86	(a) This patient had a tumor removed from the right eyebrow causing scarring hair loss. (b) After one session of single-haired FUs	118

Fig.87	A- Pre-Hair Transplant of Eyebrows B.Post-Hair Transplant of Eyebrows	119
Fig.88	A, a patient with eyebrow alopecia caused by local radiation therapy for an ocular tumor. B, image taken during the intervention in which 232 follicular grafts were transplanted C, result 9 months after transplantation	120
Fig.89	Illustration of beard transplantation	121
Fig.90	Scar 2 cm wide on donor site of 28-year-old man	137
Fig.91	Necrosis under excessive tension on donor area(137
Fig.92	Keloid in a 40-year-old man 11 months after surgery	138
Fig.93	Folliculitis in a 25-year-old man 11 months after surgery	138
Fig.94	Scalp necrosis in a 30-year-old woman 1 month after surgery.	139
Fig.95	Blood coagulopathy on the recipient area of patient with low platelet count	139
Fig.96	Unnatural hairline after follicular unit transplantation	140
Fig.97	Poor result in patient with fine hair	140
Fig.98	Poor result due to ongoing hair loss in young patient	141

Abstract

Follicular unit transplantation (FUT) is a method of hair restoration surgery that relocates hair in follicular units, its naturally occurring groupings. The small size of the units allows for great ease in their placement, the creation of hair patterns that closely mimic nature and the transplantation of a large enough number of grafts so that a full restoration can often be achieved in just one or two sessions.

Follicular unit extraction (FUE), also known as follicular transfer (FT), is one of two primary methods of obtaining follicular units, naturally occurring groups of one to four hairs, for hair transplantation, the other method is called strip harvesting.

FUE provides an alternative to FUT when the scalp is too tight for a strip excision and enables a hair transplant surgeon to harvest finer hair from the nape of the neck to be used at the hairline or for eyebrows.

Key Words:

Hair Transplantation - New Techniques- Follicular unit extraction