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Periorbital, forehead and scalp oedema after follicular unit extraction technique (FUE); Classification, management methods and outcome

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Abstract:

Background: Scalp, forehead and periorbital oedema is a normal occurrence after hair transplant surgery. However, it becomes a complication when it is of severe magnitude and cause patient distress or if there is change in the course of management.

Objective:The aim of this study is to present a review of periorbital and scalp oedema after follicular unit extraction technique with special emphasis on its clinical classification, and techniques for its management.

Methods: This is a prospective observational study of 672 patients undergoing follicular unit extraction (FUE) technique. Patients were followed during the initial post-operative period and the incidence of scalp and periorbital oedema was recorded. Observations regarding the various categories of post-operative scalp and periorbital oedema were made. We present our experience with classification and management of this clinical problem.

Results: Of the 672 male patients, mean age was 42.13±5.92 years with a range of 25 to 55 years. The mean scalp area was 34.73±7.88 cm2 with a range of 15 to 49 cm. The majority of patients were from the above 40 year age group (443, 65.9%). Overall there were 294(43.8%) cases of the upper scalp (Grade 1), 343(51%) cases of grade 2 and 35(5.2%) cases of grade-f3. There were 493(73.4%) cases who were graded as mild scalp oedema, 149(22.2%) cases were of moderate oedema and only 30(4.5%) cases of severe oedema.

Conclusion: Oedema of moderate to severe intensity expanding over forehead and peri-orbital soft tissues is most common trigger for patient concern. Re-assurance, elevation of head, ice pack application are sufficient to relieve mild to moderate grades of oedema. With increasing severity however, intravenous analgesia and cortico-steroids administration may be required.

Keywords: Hair transplantation, follicular unit extraction, post-operative oedema, peri orbital oedema

Introduction:

Peri-orbital oedema and swelling of the fore-head is a common occurrence after hair transplant procedures during the first 7 days. Mild scalp or fore-head oedema is not considered a complication of the surgery, rather a normal inflammatory response.[1] However, severe and extensive oedema causes discomfort and dissatisfaction with the surgery, especially if the oedema affect fore-head and peri-orbital regions. Peri-orbital oedema may cause difficulty in opening of eyes. These events hind early return to daily life activities and heightens patient concern.[2]

Hair transplant surgeons have come up with a diverse variety of techniques for the prevention or treatment of peri-orbital and scalp oedema after hair transplantation. These techniques reduces the injury to subdermal vascular plexus and accumulation of inflammatory mediators causing increased permeability of scalp capillaries.[3,4] These measures include medical management with the use of tumescent fluids, and physical manoeuvres to prevent the oedema formation.[5,6]

The use of an elastic band around the head, elevation of head during and after hair transplant, ice packs application and adhesive taps around

the head below the hairline are the physical measures to prevent oedema formation.[7] Medical management include prophylactic administration of steroids, either orally or parenterally, in most instances in a mixture of the local anaesthetic used for ring block.[3,8]

Studies reporting classification and management of severe post-operative oedema after hair transplant are few and experience with its management is limited.[8,9] We undertook this study in order to address the frequency, classification, prevention and the clinical impact of this complication. Management of moderate to severe oedema after hair grafting is important because this is when normal post-operative course becomes a complication. It will help hair transplant surgeons in formulating better management protocols and will have a favourable impact on improving patient outcomes.

Materials and methods:

A prospective observational study including 672 patients who underwent hair transplantation using the follicular unit extraction (FUE) technique, from January 2014 to December 2016, at Habib Hair Transplant Centre, Peshawar.

We included patients between the ages of 20 years and 60 years with male pattern hair loss using the Norwood stages II to V. Patients asked to stop taking any anti-platelet or anti-coagulants at least 7 to 10 days before surgery. If it was unsafe to stop an anti-coagulant, we excluded the patients from surgery and advised to continue medical therapy. Patients with systemic comorbidities leading to hair loss such as hypothyroidism, iron deficiency, cancer, post-chemoradiotherapy hair loss were excluded from the study.

We used a supine or lateral decubitus position with the surgeon sitting behind the patient. During the procedure, the patients could watch TV or use a handheld tablet/smartphone and can take light food like biscuits or fruit juice.

We used a powered 0.9mm punch for harvesting hair follicle grafts after applying a ring block. A tumescent solution was prepared using 50mL of normal saline with 1% lidocaine at a maximum dose of 45mg/kg with 1:200,000 epi-nephrine concentration (at a dose range of 0.65 to 1 mg/L) and 10-20 mg/L of triamcinolone. After the initial ring block, the tumescent anaesthetic was injected in two planes. A spear device was used to produce graft implant sites at a density of 40 grafts/cm2.

The following three grades were used for assessment of the severity of oedema:

1. None or mild oedema
2. Moderate oedema
3. Severe oedema

The extent of oedema was graded as follows;

1. Scalp oedema only
2. Scalp and upper fore-head
3. Scalp, complete fore-head and/or peri-orbital oedema

Pre-operatively, the patients were advised to shampoo and trim their hair to at least 1-2mm length. Oral prophylactic antibiotics (Cephradine 500 mg TDS) were started one night before surgery. At the start of surgery, injection ketorolac 30mg was used intra-venously to provide background analgesia. Post-operatively, tight dressing was applied which was to be removed after 24 hours. The patients were advised to take bath at 24 hours, washing their hair without rubbing or scratching. At day 3, the head was shampooed. Oral antibiotics were used till day 3 post-operatively.

Follow-up check-up was scheduled at 3, 7, and 28 days. Physical examination was performed to check status of any oedema during the first 3 to 7 days of the procedure. Patients with poor follow-up were dropped from final analysis.

The data was entered and analysed using SPSS version 22.0. Continuous variables are presented as mean±standard deviations. Frequencies and percentages were determined for all subcategories of the proposed classification and presented in tables. Significance level was kept at ≤0.05.

Table-1: Distribution of scalp and periorbital oedema cases across the study

Extent of edema		Severity		
		Mild	Moderate	Severe
scalp	n	243	40	11
	%	36.2%	6.0%	1.6%
scalp + forehead	n	236	94	13
	%	35.1%	14.0%	1.9%
scalp + forehead + periorbital	n	14	15	6
	%	2.1%	2.2%	0.9%

Table-2: Oedema treatment approaches according to clinical grades

Oedema grade	Conservative measures			Analgesia	Corticosteroids
1a + 1b	Reassurance	Head elevation	Ice packs	Oral paracetamol (1g PO qid)	
2a + 2b	Reassurance	Head elevation	Ice packs	Oral paracetamol 1g qid + Oral Ibuprofen 600 mg TDS	
3a + 3b	Reassurance	Head elevation	Ice packs	Intravenous ketorolac 30 mg tid	Oral prednisolone upto 45 mg/day
1c, 2c, 3c	Reassurance	Head elevation	Ice packs	Oral tramadol 50 mg tid ± Intravenous ketorolac 30mg tid	Intravenous dexamethasone 8 mg tid

Table-3: Logistic regression model with Odds ratio and 95% confidence intervals for all clinical grades

Oedema grades	B	S.E.	Wald	df	Sig.	Odds Ratio	95% C.I. for EXP(B)	
							Lower	Upper
Scalp			31.916	2	<0.0001			
Scalp + Forehead	-2.051	.462	19.676	1	<0.0001	.129	.052	.318
Periorbital + scalp + forehead	-.765	.428	3.186	1	0.074	.465	.201	1.078
Moderate	-4.373	.649	45.393	1	<0.0001	.013	.004	.045
Severe	-2.518	.656	14.713	1	<0.0001	.081	.022	.292
Constant	3.523	.746	22.311	1	<0.0001	33.892		

Results:

Of the 672 male patients, mean age was 42.13±5.92 years with a range of 25 to 55 years. The mean scalp area was 34.73±7.88 cm^2 with a range of 15 to 49cm. The majority of patients were from the above 40 year age group (443, 65.9%) while only 229(34.1%) patients were below 40 years of age. 52.7%(354) patients had a total grafted scalp area of less than 35cm^2 while 318(47%) patients had a scalp area of above 35 cm2.

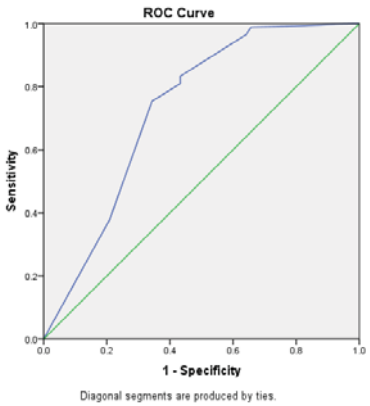

Figure 1: Receiver operating characteristic curve analysis of the clinical classification grades and return to work (<3 days versus >3 days)

The post-operative oedema cases are presented in table-1. Overall there were 294(43.8%) cases of the upper scalp oedema(grade-1), 343(51%) cases of scalp plus forehead (grade-2) and 35(5.2%) cases of scalp, fore-head oedema and peri-orbital oedema (grade-3). There were 493(73.4%) cases who were graded as mild oedema, 149(22.2%) cases were of moderate and only 30(4.5%) cases of severe oedema.

According to our proposed classification, there were 243(36.2%) cases of Grade 1a, 40(6%) cases of grade 1b, and 11(1.6%) cases of grade1c. Similarly, there were 236(35.1%) cases of grade 2a, 94(14%) cases of grade 2b and 13(1.9%) cases of grade 2c. Finally, there were 14(2.1%) cases of grade 3a, 15(2.2%) cases of grade 3b and 6(0.9%) cases of grade 3c. Table-1 The management according to different grades is listed in table-2.

A binary logistic regression was performed to ascertain the effects of the extent and severity of oedema on the likelihood that participants may or may not require further intervention post-operatively. The model was statistically significant $\chi 2\ (4) = 191.77$, $p < 0.0005$. This model explained 37.5% (Nagelkerke R2) of the variance for post-op intervention and it correctly classified 81.8% of cases. Of the six predictors in the classification, all were highly significant.

table-3. An ROC curve analysis was performed utilising the predicted probabilities from the logistic regression model for early return to work (<3 days). This analysis showed an area under the curve of 72.9% (95% confidence interval: 0.65 to 0.81, p < 0.0001). figure-1

Discussion:

Post-operative oedema after follicular unit extraction (FUE) hair transplant technique is a common occurrence. Loganathan-E and associates[8] in a retrospective study found an incidence of more than 42%. In our study, though very mild cases of upper scalp oedema are common (76%), severe oedema, which may necessitate medical intervention, admission or delay in return to daily activities is a rare occurrence and we noted it in only 0.9% to 3% of cases. The lower fore-head and peri-orbital oedema is rare with incidence of less than 1% of patients. The fore-head and peri-orbital oedema is one of the main reason for concern among patients, and is usually the prime factor, which may cause delayed return to work. Moderate fore-head oedema occurred in about 15% of patients and was one of most frequent occurrence for which patients urgently reported post-operatively, requesting medical care. We, however, did not notice any cases of severe ecchymosis or oedema associated with recipient area necrosis. Moreover, there were no cases of infective or sterile folliculitis.

Mild scalp oedema is almost invariably present in all cases of hair grafting and does not bother the patient.[10] Most patients do well with routine analgesics or ice pack application without the need for additional treatment. Moderate degree of oedema usually cause patient distress and feeling of heaviness and itchy sensation in the scalp and fore-head.[11,12] Nevertheless, patients with moderate degree of oedema seldom seek further medical care and it is resolved without the need for additional medical intervention.[13] We commonly advise patients for ice pack application, elevating head of bed, taking their routine post-operative analgesics and positive re-assurance that the episode is a foreseeable consequence of the procedure and it will be resolved within the first three days post-operatively. Most patients with moderate degree of oedema involving the fore-head and peri-orbital regions seek advice.

Severe oedema of the scalp, fore-head and peri-orbital regions is always worrisome for the patient as well as the hair transplant team. The most frequent association that we observed was with failure to use less than optimal amount of the tumescent fluid, thus making a vascular injury more likely. Perez-Meza in a review of complication management in hair restoration surgery, has summarised the need for effective tumescent solution application in order to reduce the incidence of injury to subdermal vascular plexus.[10] The most worrisome complication of severe oedema is associated ecchymosis and the development of bilateral or unilateral black eyes. Sometimes the oedema is so extensive that it causes swelling of the fore-head and peri-orbital soft tissues causing closure of the eyes, which is very distressing for the patient. Serious scalp and peri-orbital oedema is very rare and a minority of patients report this complication, mostly due to swelling, pain and bruising around the peri-orbital regions. This type of oedema need reassurance, scalp and fore-head ice packs, head elevation, oral or intravenous analgesia, sedation and dexamethasone or oral prednisolone. This degree of oedema usually resolves within 4-6 days, however, sometimes the ecchymosis leaves behind its stigmata for about 10-14 days, though it disappears completely. The majority of patients with severe periorbital, and fore-head oedema delays a patient return to work and daily life activities, thus causing significant distress. Many authors have recommended the use of tumescent fluid with 1:100,000-1:400,000 and triamcinolone acetate.[4,5,8,14]

Administration of adequate quantity of tumescent fluid lifts the hairy scalp from the sub-dermal vascular plexus, thereby helping in avoiding vascular injury and subsequent leakage of blood products and capillary fluid.[15] The tumescent fluid administered in two planes is the recommended technique.[16] In this technique, after the ring block, subcutaneous tumescent fluid is administered, which is followed by intradermal application of the same fluid. This raises the scalp

from the underlying sub-dermal vascular plexus and also pushes apart the hair follicles, thus making them easy to be harvested with a punch.[10] At our centre, we strictly follow this technique and the results have been very encouraging. We recommend that tumescent fluid be used as it will reduce the incidence of post-operative moderate to severe oedema and eventually lead to better patient satisfaction and early return to work and life activities.

Gholam ali and co-workers in a prospective study of 340 patients introduced a classification system of scalp oedema which categorised it according to the scalp and fore-head area involvement.[14] However, there was no grading for the severity of oedema. In our observation, oedema as such is invariably present and could not be counted as a complication, unless it alters the post-operative course of management. Therefore, we felt the need for further grading the oedema according to its severity. The severity of oedema is graded on clinical grounds by physical examination.

We classified the post-operative oedema in order to direct optimal management towards those who are significantly affected. As such, post-operative oedema after hair grafting techniques is present in almost all cases, though a majority of these cases are mild and resolved within three to four days. Mild degrees of oedema and discomfort is discussed with the patient in our pre-operative planning, and we educate our patients that mild degree of oedema is not a complication, rather a normal inflammatory response during the early post-operative days. This helps in preparing the patient to anticipate what would happen soon after hair grafting. However, in cases where the severity and extent of oedema is high, it creates discomfort and affect patient return to work. Predicting the course of moderate to severe post-operative scalp or peri-orbital oedema is important because it helps formulate early medical management. We classified according to the extent and magnitude, because these two factors are directly proportional to patient satisfaction and early return to work and it predicts as to which patient will need active medical management and who will be managed conservatively.

Conclusion:
Early post-operative period is almost invariable associated with some degree of scalp, fore-head or peri-orbital oedema after hair grafting. Oedema of moderate to severe intensity expanding over fore-head and peri-orbital soft tissues is most common trigger for patient concern. Reassurance, elevation of head, ice pack application are sufficient to relieve mild to moderate grades of oedema. However, some moderate grade fore-head and peri-orbital oedema require oral or intravenous analgesia and steroid administration. Severe peri-orbital and fore-head oedema always require conservative measures, intravenous analgesia, and intravenous corticosteroids.

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Role and contribution of authors:
Dr Habib Ullah Shah, collected the data, references and wrote the initial writeup.

Dr Huma Gul, helped in collection of data and in introduction writing

Dr Naeem Ullah, collected the data and references and helped in discussion writing

Dr Rashid Khan, collected the references and helped in methodology and discussion writing.

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