Endovascular treatment of scalp AVF following hair transplantation: case report

Stefano Molinaro (stefanomolinaro52@gmail.com)
Azienda Ospedaliero Universitaria Città della Salute e della Scienza di Torino: Azienda Ospedaliero Universitaria Citta della Salute e della Scienza di Torino https://orcid.org/0000-0002-7352-3107

Alberto Terrana
ASST Sette Laghi: Aziende Socio Sanitarie Territoriale dei Sette Laghi

Francesco Alberto Vizzari
ASST Sette Laghi: Aziende Socio Sanitarie Territoriale dei Sette Laghi

Andrea Giorgianni
ASST Sette Laghi: Aziende Socio Sanitarie Territoriale dei Sette Laghi

Research Article

Keywords: endovascular, fistula, coiling, embolization, hair transplant

Posted Date: April 6th, 2022

DOI: https://doi.org/10.21203/rs.3.rs-1304265/v1

Abstract

Introduction:

Scalp arteriovenous fistulas (AVF) following hair transplantation are rare; few single case reports have been described. Therapeutic options include open surgery, percutaneous and transarterial endovascular embolization; in recent years these latter have gained favour because of their minimally invasive approach also concerning post-treatment cutaneous appearance.

Case presentation:

A 29 y/o male after 3 months from a hair transplantation procedure began to notice a little pulsatile mass beneath the skin of the forehead. Subsequent diagnostic imaging (CTA and angiography) showed the presence of a scalp frontoparietal AVF with a single superficial temporal artery (STA) feeder and a superficial subcutaneous veins drainage. After a few months a sudden worsening of symptoms was reported. Endovascular treatment was performed in general anaesthesia, with right femoral arterial access, ECA catheterization, superselective STA microcatheterization right at fistula point and embolization with platinum detachable coils. No procedural complications occurred. Patient was discharged on the 4th day, asymptomatic. Clinical symptoms resolved promptly after just 3–4 weeks. A control angiogram after 6 months showed complete disappearance of the fistula.

Conclusions

Hair transplantation procedures are associated with a low risk profile, and scalp AVF is a very rare complication; both endovascular interventions and open surgery are safe and effective in treating this complication. A complete preliminary angiographic study is needed; if vascular anatomy is favourable, a transarterial approach can be performed. Coiling occlusion compared to glue embolization avoids cutaneous discoloration and/or subcutaneous mass among the fistulous point. In this case this technique was proven to be safe and effective.

Introduction

Scalp AVF are defined as a direct connection between arterial scalp vessels (distal branches of STA) and draining veins, often widely dilated, without juxtaposition of capillary bed[1]. Symptoms include headache, bruit, tinnitus, and pulsatile mass. Main causes are traumatic or iatrogenic injury to the superficial scalp vessels, such as diving or car accidents, sharp objects penetrating wounds, TMJ arthroscopy and punch-graft hair transplantation; this latter is exceedingly rare, limited primarily to single case reports. Treatment options include surgical excision or ligation of feeders, endovascular transarterial and transvenous embolization, and percutaneous injection of both glue/sclerosing agents. We present a case of scalp frontoparietal AVF following follicular hair transplantation.

Case Presentation

A 29 y-o man who had undergone a follicular unit extraction (FUE) transplantation procedure on Jan 20, began after 3 weeks to notice a little pulsatile mass of his right scalp, beneath the skin. This was continuing to enlarge over a 2–3-month period and eventually becoming symptomatic (headache) and interfering with his sleep. CTA performed after 5 months (May 20) showed the presence of an AV fistula with serpiginous vessels superficial to the right parietal bone (Fig. 1a,b). Diagnostic angiography (Jul 20) with selective catheterization of bilateral ECA and ICA confirmed the presence of the right parietal scalp fistula, with a single arterial feeder from a hypertrophied anterior branch of STA, pseudoaneurysmal appearance of fistula hole, and venous drainage through a main collector towards a large frontal vein draining bilaterally into angular and facial veins -with retrograde opacification of superior ophthalmic vein- and a second collector towards posterior auricular vein. (Fig. 2a,b,c). There were no connections with the intracranial vasculature. Contralateral ECA angiograms were unremarkable. After collegial discussion, endovascular therapy was chosen among surgical ligation and percutaneous embolization. Treatment (Sep 2020) was performed in general anaesthesia. Through a 6F right femoral access a guide catheter (Envoy DA, Codman Neurovascular, Raynham, MA, USA) was placed in proximal ECA; superselective catheterization of STA was performed with Headway Duo 156 cm microcatheter (Microvention-Terumo, Aliso Viejo, CA) and Synchro 10/14 guidewire (Stryker Neurovascular, Fremont, CA). Microcatheter was advanced right before the fistula point, followed by deployment of 17 cm of coils both bare platinum and with nylon microfilaments (Axium Prime/Micro FX, Medtronic, Minneapolis, MN) (Fig. 3a). Control angiograms at the end of the procedure showed complete occlusion of the AVF (Fig. 3b-c). There were no intraprocedural complications. Patient was discharged on the 4th day, completely asymptomatic. Follow-up angiography performed 6 months later (Mar 21) demonstrated complete occlusion of the fistula, with diameter of STA branches now similar to the contralateral (Fig. 4a-b). Clinical symptoms resolved promptly after just 3–4 weeks, and after less than 3 months the cutaneous appearance of the scalp was unremarkable (Fig. 5)

Discussion

The most common cosmetic operation for men is hair transplantation, with more than 735.000 estimated hair restoration procedures performed worldwide in 2019[2]. These procedures classically involve the resection of small patches of superficial skin containing hair follicles that are then implanted into a recipient site via an incision or punch insertion. Scalp AVF is an extremely rare complication and is related to direct vascular injury due to punches, needles, and/or micro-blades. Newer methods such as follicular unit transplantation result in far less scalp trauma and thereby a much-decreased risk of this complication[3]. Because of the very low incidence of this complication, available literature is limited to single case reports; A literature review has been performed in 2018 by Liounakos et al.[4], with 17 total cases of scalp AVF after hair transplantation available from 1970 to 2018. In 10/17 cases (58,8%) fistula was removed surgically; in 2/17 (11,7%) by transarterial embolization; in 1/17 (5,8%) with a combined embolization + excision treatment; in 3/17 (17,6%) by percutaneous direct puncture embolization; in 1/17

(5,8%) patient refused any treatment. In all cases diagnosis was made via angiography, with one or multiple arterial feeders (often bilateral) originating from STA branches, and venous drainage into one or more dilated superficial scalp veins. All surgical and endovascular interventions have resulted in a 100% resolution rate, with no recurrences reported. In recent years endovascular techniques -less invasive and allowing for simultaneous diagnosis and treatment- began to gain attention and progressively to be chosen among surgery, which can present relevant procedural difficulties because of their high flow shunting -which can lead to massive blood loss if the fistula is punctured during resection and an associated large resection area necessitating reconstructive skin procedures[5]. As the fistulous point is the primary target for embolization, both transarterial and percutaneous (directly through the scalp) approaches can be used to deliver the embolization material required for a complete obliteration of these lesions. If a percutaneous approach is chosen, some Authors point out the usefulness of occluding venous outflow (such as a small cylinder held in place with a small pressure applied circumferentially[3]), and transfemoral ECA catheterization in order to perform control angiograms. Dalyai et al[6] in 2011 reported a transvenous retrograde femoral embolization (combined use of Onyx and coils) with proximal balloon-protection in a scalp AVF with a serpiginous arterial supply coming from occipital artery, precluding both transarterial and percutaneous approaches. In our case, a transarterial approach was chosen because of limited tortuosity of the feeding vessels to the fistulous point. Coils were preferred among liquid embolic agents -such as Onyx- because of the risk by tantalum-induced black skin discoloration at the injection site[5].

Conclusion

The choice of transarterial approach appeared to be safe and effective in curing this very rare iatrogenic complication, potentially avoiding the limits of direct puncture techniques and cosmetic issues caused by surgical excision.

Abbreviations

AVF
Arteriovenous fistula
TMJ
Temporomandibular joint
FUE
Follicular unit extraction
CTA
CT angiography
ECA
External carotid artery
ICA
Internal carotid artery

STA
Superficial temporal artery

Declarations

Fundings: No funds, grants, or other support was received

Conflicts of interest: The authors have no competing interests to declare that are relevant to the content of this article.

Ethics approval: This case report was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Consent to participate: see below

Consent for publication: Patient signed informed consent regarding publishing their data and photographs

Availability of data and material: yes

Code availability: yes

Authors ‘contribution:

Study conception and design: SM, AG

Data collection: AT, FV

Analysis and interpretation: SM

Drafting: SM

All authors (SM, AT, FV, AG) reviewed and approved the final version of the manuscript

References

1. Fisher-Jeffes ND, Domingo Z, Madden M, De Villiers JC. Arteriovenous malformations of the scalp. Neurosurgery. 1995;36(4):656–60.
2. International Society of Hair Restoration Surgery (ISHRS). 2020 Practice Census Results.
3. Dua A, Dua K. Follicular unit extraction hair transplant. J Cutan Aesthet Surg. 2010;3(2):76–81. doi:10.4103/0974-2077.69015.
4. Liounakos JI, Urakov T, Snelling B, Peterson EC. Scalp Arteriovenous Fistula following Hair Transplantation: A Case Report and Review of the Literature. Clin Med Rev Case Rep. 2018;5:200. doi.org/10.23937/2378-3656/1410200.

5. Dogan S, Cinar C, Demirpolat G, Memis A. Endovascular treatment of AVF after hair transplantation. Cardiovasc Intervent Radiol. 2008;31(Suppl 2):128–30. doi:10.1007/s00270-007-9202-7.
6. Dalyai B, Schirmer RT, Malek CM. AM. Transvenous balloon-protected embolization of a scalp arteriovenous fistula using Onyx liquid embolic. Acta Neurochir (Wien). 2011 Jun;153(6):1285–90. doi:10.1007/s00701-011-0998-1. Epub 2011 Apr 9. PMID: 21479581.

Figures

Figure 1

CTA with 3D VR reconstructions showing the presence of a right hypertrophied STA with early opacification of superficial veins. No contralateral abnormalities

Figure 2

DSA (AP, LL and magnified 45° RAO) confirming the presence of an AV fistula with single feeder from a parietal branch of STA, focal pseudoaneurysm and early injection of frontal superficial, angular and facial veins

Figure 3

a: distal superselective arterial microcatheterization of fistula point and initial coil deployment b,c: control angiograms performed after complete coil deployment showing complete occlusion of AVF

Figure 4

6 months follow-up DSA (AP and LL views) showing complete occlusion of the fistula with no residual abnormalities

Figure 5

a: Clinical appearance of the subcutaneous serpiginous vessels (Apr 20) b: Complete resolution after 3 months from treatment (Dec 20)

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- CAREchecklistEnglishSNCM.pdf