

- ketoprofen: Evaluation of cross-reactivities by a combination of photopatch testing and computerized conformational analysis. *Curr Pharm Des.* 2008;14:2833–9.
7. De Argila D, Aguilera J, Sánchez J, García-Díez A. Estudio de las fotodermatitis idiopáticas y exógenas. Parte I: fisiopatología y aspectos técnicos del estudio fotobiológico. *Actas Dermosifiliogr.* 2014;105:112–21.
  8. De Argila D, Aguilera J, Sánchez J, García-Díez A. Estudio de las fotodermatitis idiopáticas y exógenas. Parte II: el estudio fotobiológico. *Actas Dermosifiliogr.* 2014;105:233–42.
  9. De la Cuadra-Oyanguren J, Pérez-Ferriols A, Lecha-Carretero M, Giménez-Arnau AM, Fernández-Redondo V, Ortiz de Frutos FJ, et al. Resultados y evaluación del fotoparche en España: hacia una nueva batería estándar de fotoalérgenos. *Actas Dermosifiliogr.* 2007;98:96–101.
  10. Gonçalo M, Ferguson J, Bonevalle A, Bruynzeel DP, Giménez-Arnau A, Goossens A, et al. Photopatch testing: Recommendations for a European photopatch test baseline series. *Contact Dermatitis.* 2013;68:239–43.
- B. Rubio-González\*  
y F.J. Ortiz-de Frutos
- Servicio de Dermatología, Hospital Universitario 12 de Octubre, Madrid, España*
- \*Autor para correspondencia.  
*Correo electrónico: rubiogonzalezbelen@gmail.com*  
(B. Rubio-González).
- <http://dx.doi.org/10.1016/j.ad.2014.06.010>

## Geometric Alopecia after Embolization of a Ruptured Aneurysm



### Alopecia geométrica tras embolización de un aneurisma roto

*To the Editor:*

Neuroradiology intervention techniques are increasingly used for treatment and diagnostic purposes, but reports of adverse cutaneous effects are rare. Herein we report a case of transient alopecia related to endovascular procedures.

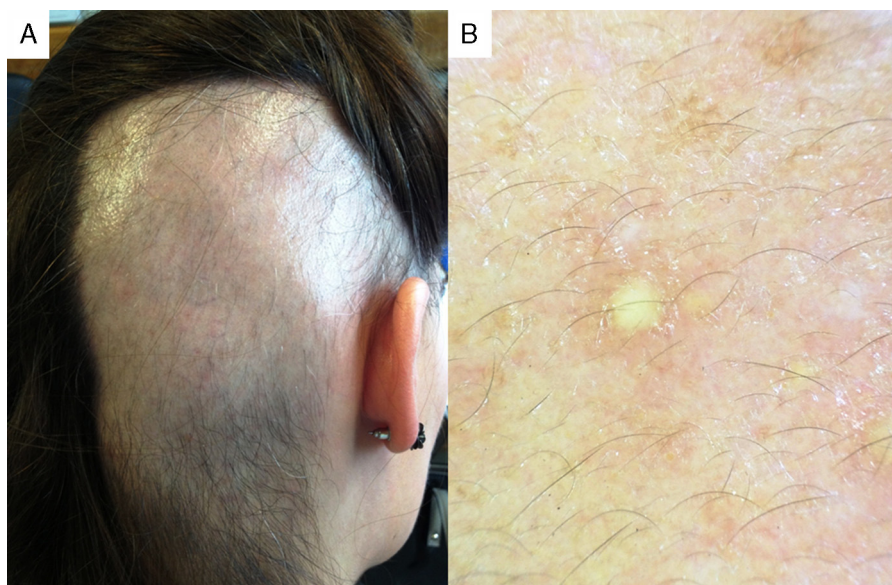
A previously healthy 26-year-old woman experienced sudden onset of severe occipital headache associated with vomiting approximately 3 h prior to admission to the emergency room. The neurological examination revealed anisocoria and mild neck rigidity. The patient had no history of trauma or other symptoms.

A computed tomography scan showed a subarachnoid hemorrhage in the posterior fossae and a digital subtraction angiography revealed an aneurysm of the basilar artery.

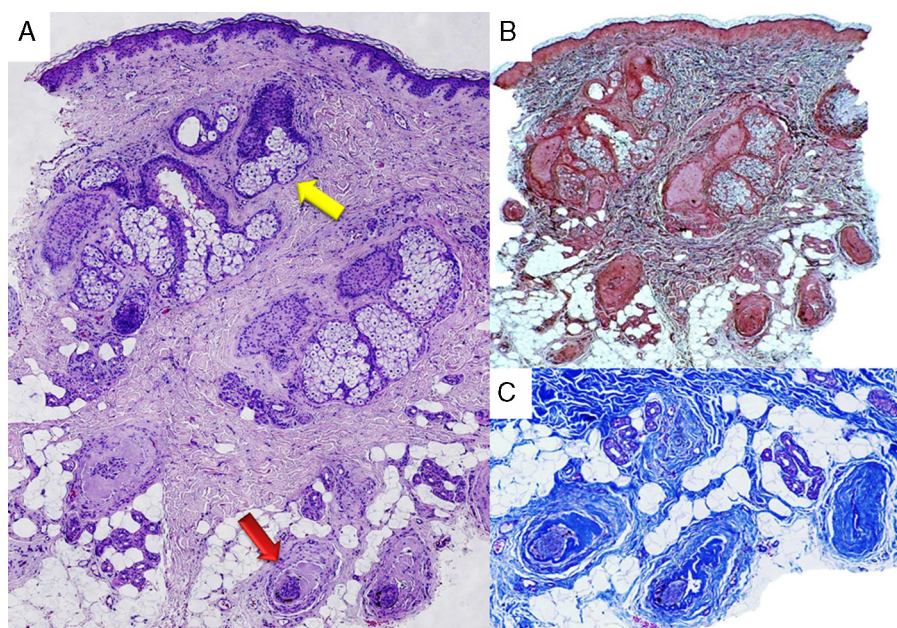
The patient underwent 3 fluoroscopically guided angiographies, which resulted in successful endovascular coiling of the aneurysm. She recovered, without neurologic sequelae, within 2 days of these procedures, which in total lasted approximately 4 h. The cumulative radiation dose was 5 Gy.

One week after the last angiography, the patient developed a sharply delineated rectangular alopecic area measuring 15 × 9 cm on the right occipital-parietal region of the scalp. The bald patch was devoid of inflammatory signs and scaling (Fig. 1A), and the pulses of the occipital and superficial temporal arteries were bilaterally palpable. The results of the pull test were unremarkable.

Trichoscopy of the alopecic area revealed marked sparseness of terminal hairs and the presence of several vellus-type hairs and yellow dots. No dystrophic hairs or black dots were observed (Fig. 1B).



**Figure 1** (A) Rectangular bald patch in the right occipital-parietal region. (B) Normal density of follicular openings, absence of terminal hairs, and presence of vellus-type hairs and yellow dots (original magnification 20×).

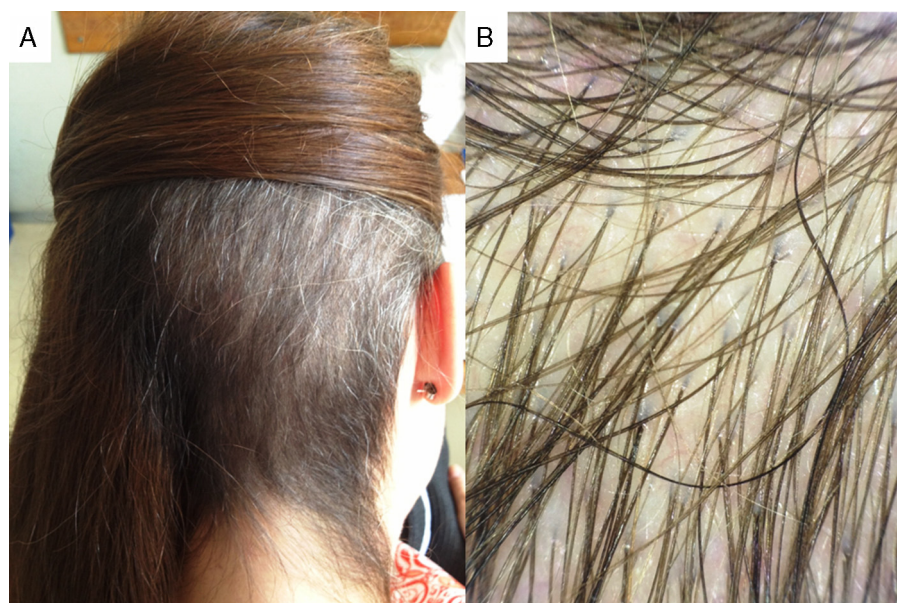


**Figure 2** Skin specimen biopsy of alopecic area. (A) Normal epidermis with no inflammatory infiltrate. Miniaturized hair follicles (red arrow), atrophy of the sebaceous glands (yellow arrow) (hematoxylin eosin, original magnification 100×). (B) Normal dermal elastic fibers (orcein, original magnification 40×). (C) Perifollicular fibrosis (trichome, original magnification 100×).

The histopathological examination of a biopsy specimen from the affected area revealed miniaturized hair follicles surrounded by fibrosis and atrophy of the sebaceous glands (Fig. 2).

Radiation and pressure-induced types of alopecia, as well as alopecia areata and trichotillomania, were considered in the differential diagnosis. However, radiation-induced hair loss was the most plausible cause in the clinical setting of the patient. After 3 months of follow-up without treatment, the hair had regrown completely (Fig. 3).

Radiation-induced alopecia after fluoroscopically guided interventional procedures is a form of radiodermatitis.<sup>1,2</sup> As occurred in our patient, exposure to a relatively low dose of radiation (3–7 Gy) can lead to transient epilation caused by damage to the actively dividing matrix cells of the anagen hair follicles.<sup>1,3</sup> Anagen effluvium develops within several days or weeks, and is usually followed by transient miniaturization of anagen hairs and the emergence of broken hairs as a result of the loss of follicle stem cells.<sup>1</sup> Furthermore, the premature catagen entry of follicles in late anagen can



**Figure 3** (A) Complete repopulation of the alopecic area after 3 months of follow-up. (B) Normal density of follicular openings with terminal hairs (original magnification 20×).



also trigger observable telogen shedding 2.5–4 months after exposure.<sup>4</sup> As occurred in our case, hair regrowth generally occurs 2–4 months after low radiation dose exposure and therefore no treatment is currently indicated. Nevertheless, permanent alopecia can be expected after radiation doses above 7 Gy.<sup>2</sup>

Temporary alopecia following therapeutic embolization of aneurysms, arteriovenous malformations, and tumors has been previously reported.<sup>4–10</sup> The complexity of posterior circulation aneurysm coiling procedures, such as those performed in our patient, has been linked to longer fluoroscopy time, increasing the risk of radiation-induced skin damage.<sup>8</sup> Cumulative radiation dose, intervals between sessions, total irradiated area, and variations in the incidence angle are important determinants of injury severity.<sup>1</sup> In our patient, the location and geometric configuration of the bald patch are consistent with prolonged radiation exposure in the same area with limited variation of the direction of application during the fluoroscopically guided interventions.

Our report emphasizes the need for awareness of the risk of alopecia originating from fluoroscopically guided techniques. While rare and probably underdiagnosed, this adverse effect may increase in incidence due to the growing use of minimally invasive endovascular procedures for the diagnosis and treatment of neurovascular disorders.

## Acknowledgments

We thank E. Rios MD and J.M. Lopes PhD, from the Department of Pathological Anatomy, Centro Hospitalar São João EPE in Porto, Portugal and IPATIMUP (Instituto de Patologia e Imunologia Molecular da Universidade do Porto) in Porto, Portugal for providing the histologic images.

## Bibliografía

- Balter S, Hopewell JW, Miller DL, Wagner LK, Zelefsky MJ. Fluoroscopically guided interventional procedures: a review of radiation effects on patients' skin and hair. *Radiology*. 2010;254:326–41.
- Mooney RB, McKinstry CS, Kamel HA. Absorbed dose and deterministic effects to patients from interventional neuroradiology. *Br J Radiol*. 2000;73:745–51.
- Ali SY, Singh G. Radiation-induced alopecia. *Int J Trichol*. 2010;2:118–9.
- Tosti A, Piraccini BM, Alagna G. Temporary hair loss simulating alopecia areata after endovascular surgery of cerebral arteriovenous malformations: a report of 3 cases. *Arch Dermatol*. 1999;135:1555–6.
- D'Incan M, Roger H, Gabrillargues J, Mansard S, Parent S, Chazal J, et al. Radiation-induced temporary hair loss after endovascular embolization of the cerebral arteries: six cases. *Ann Dermatol Venereol*. 2002;129 5 Pt 1:703–6.
- Huda W, Peters KR. Radiation-induced temporary epilation after a neuroradiologically guided embolization procedure. *Radio-logy*. 1994;193:642–4.
- Lopez V, Lopez I, Ricart JM. Temporary alopecia after embolization of an arteriovenous malformation. *Dermatol Online J*. 2012;18:14.
- Nannapaneni R, Behari S, Mendelow D, Gholkar A. Temporary alopecia after subarachnoid haemorrhage. *J Clin Neurosci*. 2007;14:157–61.
- Thorat JD, Hwang PY. Peculiar geometric alopecia and trigeminal nerve dysfunction in a patient after Guglielmi detachable coil embolization of a ruptured aneurysm. *J Stroke Cerebrovasc Dis*. 2007;16:40–2.
- Wen CS, Lin SM, Chen Y, Chen JC, Wang YH, Tseng SH. Radiation-induced temporary alopecia after embolization of cerebral arteriovenous malformations. *Clin Neurol Neurosurg*. 2003;105:215–7.

A. César<sup>a,b,\*</sup>, T. Baudrier<sup>a</sup>, A. Mota<sup>a,b</sup>, F. Azevedo<sup>a</sup>

<sup>a</sup> Department of Dermatology and Venereology, Centro Hospitalar São João EPE, Porto, Portugal

<sup>b</sup> Faculty of Medicine, University of Porto, Porto, Portugal

\* Corresponding author.

E-mail address: [arturjfc@gmail.com](mailto:arturjfc@gmail.com) (A. César).

<http://dx.doi.org/10.1016/j.ad.2014.08.008>

## Pediatric generalized morphea that developed at a BCG vaccination site



### Morfea generalizada pediátrica de aparición en el sitio de la inyección de la vacuna BCG

To the Editor:

An 8-year-old girl was referred to our department with a linear sclerotic lesion on the upper left arm that had appeared several months earlier. The lesion had developed on the upper lateral aspect of the left arm, at the site of a Bacille Calmette-Guerin (BCG) vaccine, given more than 7 years earlier. It had gradually spread in a linear pattern and new sclerotic plaques appeared in increasing numbers over the

subsequent months. Physical examination revealed a linear, slightly sclerotic plaque on the forehead (scleroderma en coup de sabre), linear pigmented, shiny plaques on the upper left arm, and sclerotic plaques on the right abdomen, left axilla, and back (Fig. 1A–C). The girl also complained of muscle weakness in the upper left arm and occasional headaches. A biopsy specimen taken from the BCG vaccination site revealed thickened collagen bundles throughout the dermis (Fig. 2). Patchy lymphocytic infiltrates and fibrosis of septal connective tissues were seen in the subcutaneous tissue. Laboratory tests revealed positive antinuclear antibodies (1:320, speckled and nucleolar) and values within the normal range for rheumatoid factor and anti-DNA, anti-centromere, and anti-U1RNP antibodies. Liver and kidney function, serum complement levels, creatine phosphokinase, aldolase, and myoglobin were also all within normal ranges. Three-dimensional computed tomography of the