INTRODUCTION

Erlotinib is a selective epidermal growth factor receptor inhibitor (EGFRI) utilized in the treatment of solid tumors. Cutaneous side effects, including changes in hair texture and alopecia, have been described. In this case report, we describe two patients with a new finding of loose anagen hairs and pili torti leading to nonscarring marginal and diffuse alopecia and discuss potential mechanisms underlying erlotinib-induced hair changes.

CASE REPORT

A 78-year-old female had been diagnosed 10 years earlier with bronchioloalveolar carcinoma. She has been on erlotinib monotherapy for the past 4 years. Her hair progressively became curlier, brittle, and dull and the overall hair volume decreased. The second patient who was a 60-year-old female with metastatic adenocarcinoma of the lung had been on erlotinib for over a year when she noticed increased hair loss. Examination of both revealed a band of nonscarring alopecia along the entire hair margin [Figure 1a and b] associated with diffuse thinning and eyelash trichomegaly in the second patient. Trichoscopy showed irregularly shaped shafts and bending at different angles, numerous black dots and broken hairs and no inflammation [Figure 2a]. Structures resembling rectangular black granular structures were also seen [Figure 2b]. Pull test extracted multiple hairs easily and painlessly. High magnification revealed anagen hairs devoid of sheaths and multiple twisting of flattened shafts through 180° at irregular intervals [Figure 2c and d]. Scalp biopsies, performed in the first patient, revealed normal telogen count of 10%. Anagen follicles showed irregular thinning of the outer root sheath (ORS) and a serrated vitreous layer. Several follicles showed features of hair breakage with pigmented casts, increased number of apoptotic cells in the ORS, and disintegrated inner root sheath (IRS). Sebaceous glands were absent [Figure 2e and f]. Diagnosis of hair breakage associated with pili torti and loose anchoring of anagen hairs induced by erlotinib was made. Topical steroids and minoxidil 5% were empirically prescribed to the second patient, with significant improvement after 3 months [Figure 1c].

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DISCUSSION

Reported EGFRI-induced hair changes include curlier and brittle hair on scalp and extremities, trichomegaly or curling of the eyelashes and eyebrows, and facial hypertrichosis as well as inflammatory and noninflammatory alopecia. In mice harboring a disruption of the epidermal growth factor receptor-allele, hair follicles fail to enter catagen and remain in an aberrant anagen state and display thinning or loss of the IRS and ORS. Irregular atrophy of the distal ORS, as observed in our biopsies, has been described as “arrow sign.” IRS abnormalities might be responsible for the loose anchoring of anagen hairs in our patients, as also reported in loose anagen hair syndrome (LAHS). Another possible similarity to LAHS were dermoscopic features resembling black rectangular granular structures, which have been recently associated with this syndrome. Hair texture modification and fragility, including pili torti, have also been linked to anomalies in the IRS. The absence of sebaceous glands detected is in accordance with previously published data reporting marked disruption of sebaceous gland growth in EGFRI-treated patients. The corrugated vitreous layer is of unknown significance.

Finally, both patients wear wigs. It is possible that the elastic bands used to fasten the wigs led to increased friction over the scalp rim explaining the pronounced marginal alopecia.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Robert C, Soria JC, Spatz A, Le Cesne A, Malka D, Pautier P, et al. Cutaneous side-effects of kinase inhibitors and blocking antibodies. Lancet Oncol 2005;6:491-500.
2. Cheng PS, Lai FJ. “Arrow” sign: A rapid microscopic diagnosis of hair change associated with epidermal growth factor receptor inhibitors. J Am Acad Dermatol 2013;69:489-92.
3. Murillas R, Larcher F, Conti CJ, Santos M, Ulrich A, Jorens JL. Expression of a dominant negative mutant of epidermal growth factor receptor in the epidermis of transgenic mice elicits striking alterations in hair follicle development and skin structure. EMBO J 1995;14:5216-23.
4. Mirmirani P, Uno H, Price VH. Abnormal inner root sheath of the hair follicle in the loose anagen hair syndrome: An ultrastructural study. J Am Acad Dermatol 2011;64:129-34.
5. Mirmirani P, Samimi SS, Mostow E. Pili torti: Clinical findings, associated disorders, and new insights into mechanisms of hair twisting. Curr 2009;84:143-7.
6. Inoue A, Arima N, Ishiguro J, Prestwich GD, Arai H, Aoki J. LPA-producing enzyme PA-PLA\(\alpha\) regulates hair follicle development by modulating EGFR signalling. EMBO J 2011;30:4248-60.
7. Guttman-Yassky E, Mita A, De Jonge M, Matthews L, McCarthy S, Iwata KK, et al. Characterisation of the cutaneous pathology in non-small cell lung cancer (NSCLC) patients treated with the EGFR tyrosine kinase inhibitor erlotinib. Eur J Cancer 2010;46:2010-9.