INTRODUCTION

Frontal fibrosing alopecia (FFA) represents a distinctive condition with a marginal scarring alopecia along the frontal and temporal hairline with scarring. Steven Kossard is credited with the original description of the condition in 1994. Affected women typically present with the complaints of asymptomatic, progressive recession of the frontal hairline and loss of eyebrows. Scalp biopsy specimens originally revealed histologic and immunohistochemical features of lichen planopilaris (LPP) so that eventually Kossard interpreted this type of alopecia as a frontal variant of LPP. Since Kossard’s original description, FFA has been recognized to represent a more generalized than localized process, with extension beyond the frontotemporal hairline to include the parieto-occipital hairline and involve peculiar facial papules as evidence of facial vellus hair involvement and loss of peripheral body hair. Finally, the association of FFA with oral lichen planus, nail involvement, and concomitant lichen planopilaris (LPP) points to a close relationship to lichen planus. The Koebner phenomenon or isomorphic reaction has been described in lichen planus, LPP, and ultimately FFA, with face-lift procedures and hair restoration surgery having been implicated as the culprits in the latter. We report the first case of FFA in whom LPP developed at the sites of wig attachments, providing the evidence for Koebner phenomenon. Therefore, wigs are to be included to the list of procedures for hair restoration at risk of eliciting an isomorphic reaction in patients with FFA. Ultimately, the association of Koebner phenomenon with LPP-type lesions in FFA may provide further insight into the underlying pathology and nosology of the condition.

Key words: Frontal fibrosing alopecia, isomorphic reaction, Koebner phenomenon, lichen planopilaris, wig attachment

Case Report

Lichen Planopilaris Caused by Wig Attachment: A Case of Koebner Phenomenon in Frontal Fibrosing Alopecia

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ABSTRACT

Frontal fibrosing alopecia (FFA) represents a distinctive condition with a marginal scarring alopecia along the frontal and temporal hairline. Since its original description, the condition has been recognized to represent a more generalized than localized process, with extension beyond the frontotemporal hairline to include the parieto-occipital hairline and involve peculiar facial papules as evidence of facial vellus hair involvement and loss of peripheral body hair. Finally, the association of FFA with oral lichen planus, nail involvement, and concomitant lichen planopilaris (LPP) points to a close relationship to lichen planus. The Koebner phenomenon or isomorphic reaction has been described in lichen planus, LPP, and ultimately FFA, with face-lift procedures and hair restoration surgery having been implicated as the culprits in the latter. We report the first case of FFA in whom LPP developed at the sites of wig attachments, providing the evidence for Koebner phenomenon. Therefore, wigs are to be included to the list of procedures for hair restoration at risk of eliciting an isomorphic reaction in patients with FFA. Ultimately, the association of Koebner phenomenon with LPP-type lesions in FFA may provide further insight into the underlying pathology and nosology of the condition.

Key words: Frontal fibrosing alopecia, isomorphic reaction, Koebner phenomenon, lichen planopilaris, wig attachment

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How to cite this article: Taguti P, Dutra H, Trüeb RM. Lichen planopilaris caused by wig attachment: A Case of Koebner phenomenon in Frontal Fibrosing Alopecia. Int J Trichol 2018;10:172-4.
We report a patient with FFA, in whom LPP at the sites of wig attachments provides evidence for the underlying LPP with Koebner phenomenon.

**CASE REPORT**

We present the case of a 59-year-old woman (patient no. 18196) with FFA who developed plaques of scarring alopecia from using a wig.

She had suffered of a progressive recession of the frontal hairline and loss of eyebrows since 2010 and treated on and off with topical corticosteroids. She came to the clinic wearing a wig.

On removing the wig, we observed five bilateral, symmetrical rounded patches of alopecia in the midline occipital, temporal, and retroauricular regions [Figure 1a]. Dermoscopic examination revealed loss of follicular orifices with mild erythema and perifollicular scaling typical for LPP [Figure 1b].

The culprit for these patches of alopecia was obviously the fasteners on the underside of the wig to fix the wig to the head [Figure 2].

The FFA presented with marginal alopecia along the frontal and temporal hairline [Figure 3a] that was associated with perifollicular erythema and scaling within the marginal hairline [Figure 3b] and loss of eyebrows. The distance from the former site of eyebrows that was marked with an eyeliner to the frontal hairline measured 11 cm. There was no further evidence of lichen planus of the glabrous skin, the oral mucosa, and the nails.

We made a diagnosis of scarring alopecia from LPP lesions that had developed as a Koebner phenomenon due to pressure of the fasteners imposed when the wig was being worn. The patient wore the wig a minimum of 8 h a day when she was in public.

**DISCUSSION**

The Koebner phenomenon or isomorphic reaction represents the development of lesions characteristic of a particular disease at the site of a usually physical trauma.\(^\text{[10]}\) Originally reported in 1876 by German dermatologist Heinrich Koebner (1838–1904), in psoriasis,\(^\text{[11]}\) the phenomenon is observed in a number of dermatologic conditions, with various eliciting factors accounting for the particular cutaneous response.\(^\text{[12]}\) Among these, only psoriasis, lichen planus, and vitiligo are included in the group of true koebnerization or Category I of the Boyd–Neldner classification.\(^\text{[13]}\) In this case, koebnerization is inseparable from the pathogenesis, treatment, and prognosis of the underlying specific dermatologic condition.

The Koebner phenomenon is thought to be triggered by a nonspecific inflammatory response to skin trauma through the production of stress proteins, cytokines, adhesion molecules, or exposure of autoantigens from normally sequestered intracellular compartments.\(^\text{[14]}\) With regard to
its pathogenesis, LPP is considered to be a T-cell-mediated autoimmune reaction that triggers apoptosis of the follicular epithelial cells. This autoimmune process is thought to be in response to some antigenic challenge, but a specific antigen has yet not been identified. Harris et al.[13] provided the first evidence that LPP may result from an immune privilege collapse of the hair follicle’s epithelial stem cell niche. Ultimately, the observation of cutaneous graft versus host disease (GvHD) presenting as cicatricial pattern hair loss may help us to understand the underlying pathophysiology: [11,18] GvHD is a complication following allogeneic tissue transplantation and is induced and maintained by immunocompetent cells from the donor tissue that particularly attack epithelia of fast-proliferating tissues in the recipient. Due to analogies with lichen planus in its clinical presentation, cutaneous GvHD constitutes a valid immunologic model for cicatricial pattern hair loss with a follicular lichenoid inflammatory reaction pattern.

The lag period to koebnerization may be as short as 3 days or as long as 2 years, possibly reflecting varying degrees of sensitivity for development of the Koebner response, unique of the specific individual’s skin and pathologic condition.[12]

The Koebner phenomenon has been described in both classic LPP and FFA. Besides accidental trauma, elective cutaneous surgical techniques have been implicated in koebnerization phenomena, specifically face-lift procedures and hair restoration surgery on the scalp of susceptible patients.[10] Finally, a case of follicular lichen planus interpreted as Koebner phenomenon caused by wig use has been reported, more specifically by the fasteners on the underside of the wig to fix it to the head.[17]

We add our observation of LPP at the sites of wig attachments to the list of procedures for hair restoration, eliciting an isomorphic reaction in a patient with FFA. The association of Koebner phenomenon with LPP-type lesions in a patient with FFA may provide further insight into the underlying pathology and nosology of the condition.

Much in the same way caution is recommended for surgical interventions during active disease, care must be given to the sites of attachment of wigs and hair pieces in patients with FFA. Patients with FFA are probably best advised by instructing them to exercise caution with regard to trauma to their scalp skin, as well as by recommending treatment modalities, entailing a minimum of irritation and inflammation.

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.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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