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Chemically induced cosmetic alopecia

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Summary Cosmetic causes of scarring alopecia are poorly documented. They include traction alopecia and hot-combing. Recently, another group has presented in the South London area, related to misuse of chemical hair straightening agents. Affected patients are young, female, of Afro-Caribbean origin, and typically display hair loss on the vertex of the scalp. Histology shows a pattern of fibrosis and inflammation characteristic of the physical damage seen with other cosmetic procedures. This histological pattern is distinguishable from other non-cosmetic causes of scarring alopecia.

Cases of alopecia are usually classified as scarring (cicatricial) and non-scarring.[1] The cicatrical varieties may be further subdivided according to cosmetic and non-cosmetic causes. The cosmetic causes are poorly documented, and affect mainly young adult, Afro-Caribbean females who, as a result of various hair treatments, may suffer considerable loss of hair. Traction alopecia, where the hair is pulled tight across the scalp, causes a typical frontal and lateral pattern of hair loss, dependent on the direction of force applied.[2] Hot-combing was one of the original methods of hair straightening which entailed massaging oils into the hair and then running a hot comb through it, with the hair extended perpendicular to the scalp. In 1968, Lo Presti *et al.*[3] described alopecia on the vertex of the scalp in 51 patients who had used this technique. The vertex is the principal site affected, because the hot oils track down the hair shafts on to the scalp and cause burning, scarring and eventual alopecia. However, this concept has recently been challenged by Sperling and Sau[4] who found poor correlation between hot-combing and the onset of alopecia, and prefer the term 'follicular degeneration syndrome' to describe what they believe to be a clinically and histologically distinct form of scarring alopecia. Patients with a similar alopecia on the vertex, but with no history of hot-combing, have presented to our department. In this group, chemical agents appear to be responsible for the hair loss. Such agents are referred to as 'relaxers' and 'straighteners' in the hairdressing trade, and are either sodium hydroxide- or ammonium thioglycollate-based. They have the advantage of permanently straightening hair by rearranging disulphide bonds. This is in contrast with hot-combing where, once the hair becomes wet, it returns to its normal shape.[5]

We describe the clinical and pathological features in eight cases of scarring alopecia attributable to chemical hair treatments.

Methods

The records of patients referred to the Dermatology Department at St George's Hospital with scarring alopecia since 1985 were examined. A history of the type, frequency and duration of any hair treatment, and the site of subsequent hair loss, was recorded. Where possible, the patient was recalled, and a biopsy, if not already performed, was taken. The biopsy was taken from the edge of a focus of scarring in order that the pathological effect on partly damaged follicles could be assessed, the intention being to distinguish its pattern from those of non-cosmetic causes.

Results

A total of eight patients admitted using chemical hair treatments, and six of these patients were biopsied. Their clinical details are summarized in Table 1. All patients were Afro-Caribbean women who were mainly young (age range 24–53, mean 31·4 years). Scarring alopecia was present over the vertex in all cases, although diffuse and frontoparietal involvement was also present in four (Figs 1 and 2). Obtaining precise information about the onset of alopecia in relation to specific treatments was difficult, mainly because most patients gave histories of a variety of cosmetic procedures, often over a period of years. However, in those cases where an accurate history was available, the onset of alopecia was variable, ranging from the first 2 weeks after a single application,

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Table 1. Clinical details of patients presenting with chemical cosmetic alopecia

Case no.	Age	Ethnic origin	Sex	Site	Chemical agent	Other cosmetic procedures	Evidence of misuse
1	34	A/C	F	Vertex	Yes (NaOH-based)	Hot-combing	Application of agents for 45-min periods
2	24	A/C	F	Vertex/FP	Yes (NaOH-based)	Traction	Three treatments in 10 days
3	24	A/C	F	Diffuse	Yes (NaOH-based)	No	None documented
4	53	A/C	F	Vertex	Yes (not specified)	Multiple	Two treatments within 1-month period
5	26	A/C	F	Diffuse	Yes (not specified)	No	Change in type of chemical agent
6	33	A/C	F	Vertex/FP	Yes (NaOH-based)	Traction	None documented
7	28	A/C	F	Vertex	Yes (NaOH-based)	Plaiting	None documented
8	29	A/C	F	Vertex	Yes (NaOH-based)	No	None documented

A/C, Afro-Caribbean; NaOH, sodium hydroxide; FP, frontoparietal.

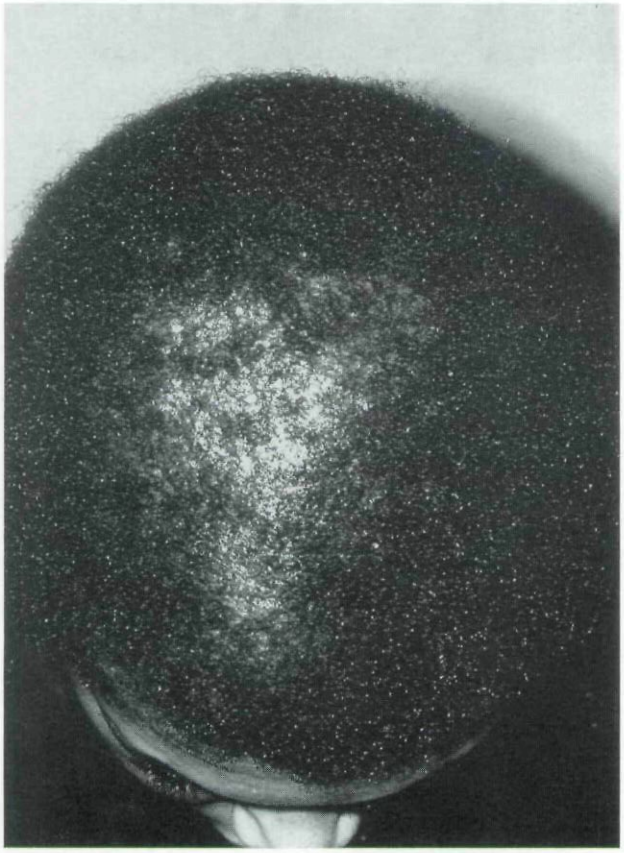

Figure 1. Typical distribution of chemically induced scarring alopecia on the vertex.

Figure 2. Alopecia on the vertex and frontoparietal regions as a result of a combination of traction and chemical agents.

to hair loss after 5 years of regular use. A chemical agent had been used in all cases, and in six cases sodium hydroxide (a relaxer) was identified as the active compound. In five cases, there was additional use of traction or other cosmetic procedures. Traction was thought to have been an additional aetiological factor for the two cases in whom frontoparietal involvement was apparent. Definite evidence of misuse was detected in four cases, and all eight patients described a 'burning' sensation after application. On clinical examination, one patient (case 1) was also noted to have numerous pili multigemini on examination of the affected area.

Histologically, multiple levels were essential in order to fully assess the pathological features. Hyperkeratosis was present in all six cases, with focal parakeratosis noted in three. The epidermis often appeared acanthotic

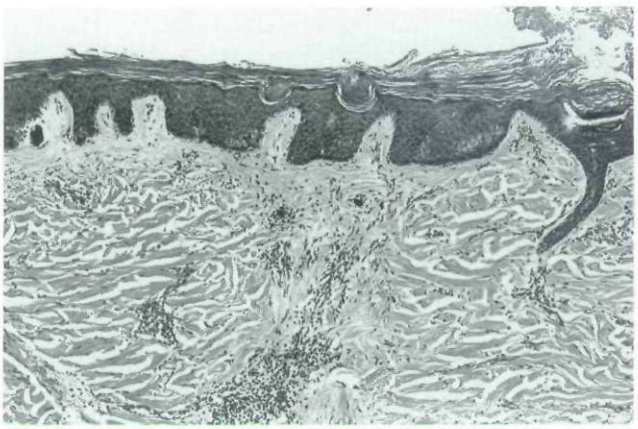

Figure 3. Acanthotic epidermis with hyperkeratosis and focal parakeratosis, overlying a scarred hair follicle. There is a mild inflammatory infiltrate.

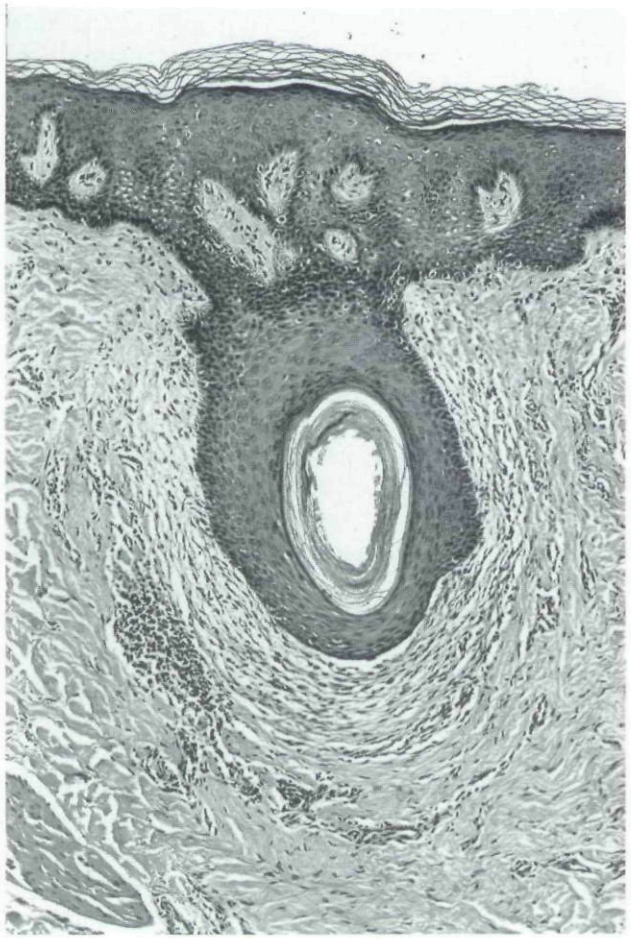

Figure 4. Hair follicle showing surrounding lamellar fibrosis, and an adjacent chronic inflammatory cell infiltrate.

Figure 5. Abscess formation within the superficial part of the hair follicle.

(Fig. 3). In the dermis, a perifollicular chronic inflammatory cell infiltrate, together with perifollicular fibrosis exhibiting a lamellar pattern, was identified (Fig. 4), and in two cases there was abscess formation within the superficial part of the hair follicle (Fig. 5). More marked changes consisted of naked hair shafts within the dermis (Fig. 6), with eventual total replacement of hair follicles by fibrosis, in areas resembling a 'balustrade' of vertically orientated scarring (Fig. 7).

Discussion

Relaxers and straighteners are caustic substances, with their pH strictly regulated, and all commercial products carry specific instruction regarding application. These state that the procedure should be performed no more than once in 8 weeks, and for a maximum of 20 min, only to new hair growth (if a relaxer or straightener has been used previously), and to within no more than 1 cm

Figure 6. Naked hair shaft in the dermis. Perifollicular scarring and chronic inflammation is more pronounced.

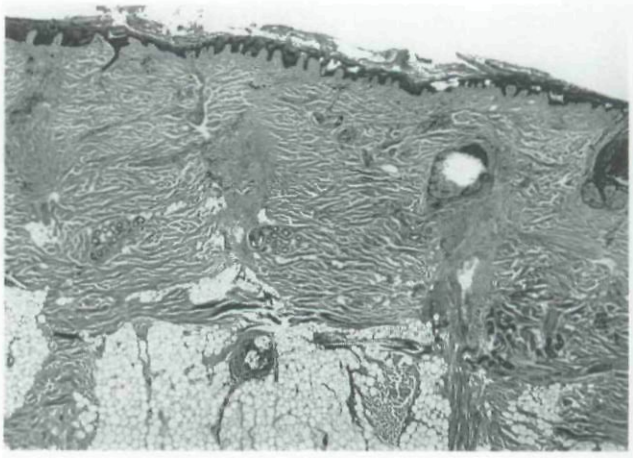

Figure 7. Complete replacement of hair follicles by vertical bands of fibrosis.

of the scalp surface. It is also noted that they should never be applied in conjunction with other straightening or even recolouring agents. The reasons for such strict regulations are that the ultrastructural rearrangement increases the fragility of the hair shaft, and that the caustic nature of the agents will cause damage to the scalp.[5] Therefore, on reviewing the results from Table 1, at least four of the cases appear to result from either deliberate misuse or ignorance of the technique on the part of the individual applying the chemicals. The sodium hydroxide-based products (relaxers) are more caustic than those which are ammonium thioglycollate-based (straighteners),[5] and where the type of compound has been documented in relation to hair loss, these more alkaline compounds are responsible.

The variability in the onset of alopecia after application could be due to the relative severity of the insult, but other factors, such as additional cosmetic procedures and even weathering effects, are also likely to play a role.[6]

The results also show that this form of alopecia is limited to the younger, female Afro-Caribbean population, and that hair loss is predominantly confined to the vertex of the scalp. Pili multigemini, noted in case 1, are of value in supporting a diagnosis of chemically induced scarring alopecia, but they are not specific, because they may occur as a result of several other follicular disorders,[7] as well as other distinct cosmetic causes.[3]

The majority of the microscopic appearances described here are noted by Lo Presti *et al.*[3] in relation to hot-combing, except that they reported epidermal atrophy rather than acanthosis. This may be due to the biopsy site having been towards the centre of the lesion rather than at the periphery. The features we delineate are also described by Sperling and Sau[4] in their detailed histological analysis of follicular degeneration syndrome. It is interesting to note that, of the 10 patients in their report, eight admitted the use of relaxers, and the other two admitted to perming which, in some instances, utilizes the ammonium thioglycollate-based straighteners. In addition, nine of the 10 patients were combining chemical application with other hair care techniques. From our series of cases, we believe that the abnormalities observed are related to the combination or sum effects of physical and chemical insults rather than to the alkalis alone. It is suspected that there is a natural progression from mild fibrosis and inflammation through loss of the hair follicle to end-stage scarring, but further studies with multiple biopsies would be required in order to prove this. Where follow-up has been possible, no significant regrowth has been seen.

In summary, we feel that the cosmetically induced alopecias are far more prevalent in the community than hitherto realized, especially in areas with a prominent Afro-Caribbean population. In a patient presenting with hair loss on the vertex of the scalp, a history of any hair treatment should be sought. In particular, specific reference should be made to relaxers and straighteners, their frequency of use and duration of application, and whether their use was accompanied by a burning sensation on the scalp.

Biopsy of the affected areas is recommended, as histology may provide valuable information in distinguishing cosmetically induced alopecias from diseases such as discoid lupus erythematosus or lichen planopilaris. The histological appearance is also distinguishable from that of trichotillomania.[8]

Despite the precise instructions which all these products carry, they are being frequently ignored by the users. Therefore, as long as individuals desire to conform with the dictates of fashion, the misuse of these chemical agents will continue. Recognition of chemically induced alopecia is important, in order that clinicians may provide appropriate advice on the avoidance of such irritants.

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