

BRIEF REPORTS

Treatment of permanent chemotherapy-induced alopecia with low dose oral minoxidil

Xinyi Yang¹ and Keng-Ee Thai²¹Faculty of Medicine, University of New South Wales, Sydney and ²Brien Walder Department of Dermatology, Prince of Wales Hospital, Randwick, New South Wales, Australia**ABSTRACT**

Chemotherapy-induced alopecia is a well-established cause of major distress to patients. Permanent chemotherapy-induced alopecia (PCIA) is the absence of or incomplete hair regrowth lasting longer than 6 months after the cessation of chemotherapy and it does not respond to standard treatments of scalp cooling or topical minoxidil. The increasing numbers of reports of PCIA highlight the need for research into an effective treatment. We report a case of a 39 year-old woman with cosmetically significant regrowth after continuous therapy with oral minoxidil.

Key words: alopecia, chemotherapy-induced alopecia, minoxidil, permanent alopecia, systemic therapy.

INTRODUCTION

Chemotherapy-induced alopecia is usually reversible, with new hair cycles beginning 3 to 6 months after the completion of treatment. In contrast, permanent chemotherapy-induced alopecia (PCIA) is the absence of or incomplete hair regrowth lasting longer than 6 months after the cessation of treatment.^{1,2} PCIA is commonly associated with busulfan-containing regimens and bone marrow transplant for haematologic malignancies.¹ It has also been reported following the use of cyclophosphamide, melphalan, thiotepa, carboplatin, docetaxel, paclitaxel, tamoxifen and alfa-2a interferon.^{1,5} The histopathologic criteria for PCIA

are yet to be confirmed.⁴ Common findings in PCIA show increased vellus hair counts and the presence of thin epithelial structures thought to be the remnants of secondary hair germ of late-stage telogen follicles. These latter structures may be inadequate in forming new anagen follicles for hair regrowth.¹ We present a case of PCIA with a successful response to oral minoxidil.

CASE REPORT

Our patient is a 39 year-old Caucasian woman who had acute myeloid leukemia. She was treated successfully with a course of cyclophosphamide and busulfan chemotherapy followed by a matched, unrelated donor bone-marrow transplant. PCIA was clinically diagnosed based on no cosmetically meaningful hair regrowth 16 months post-transplant. There was no prior history of alopecia nor sclerodermoid graft-versus-host disease post-transplant. On examination there was scant, incomplete coverage of short scalp hairs, with wide expanses of bare scalp between some strands: a 'trees left standing' appearance. She claimed no further lengthening beyond that shown in Figure 1.

Prior to treatment, two 4 mm punch biopsies were obtained from the vertex of the scalp, where the alopecia was most severe. Histopathology showed a markedly increase in telogen count and miniaturization of hair follicles. An increased number of fibrous tracts were found, consistent with previous descriptions of PCIA.¹ No fibrosis or lichenoid changes were seen (Fig. 2).

While the presence of fibrous tracts portends a poor prognosis for regrowth, the presence of multiple remaining telogen follicles gave the authors an idea. Minoxidil is known to recruit hairs from telogen into a prolonged, drug-sustained anagen phase.⁵ The use of 5% topical minoxidil has been described in three case reports, all showing clinically unsatisfactory regrowth at 6 months.^{2,6} Oral minoxidil has been used in our practice as an adjunct to traditional anti-androgens in the treatment of female-pattern androgenetic alopecia. Our use of oral minoxidil 1 mg daily in the patient was much lower than the dosage of 5–100 mg daily for hypertension.

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Abbreviation:

PCIA permanent chemotherapy-induced alopecia



Figure 1 Clinical photograph of permanent chemotherapy-induced alopecia prior to therapy.

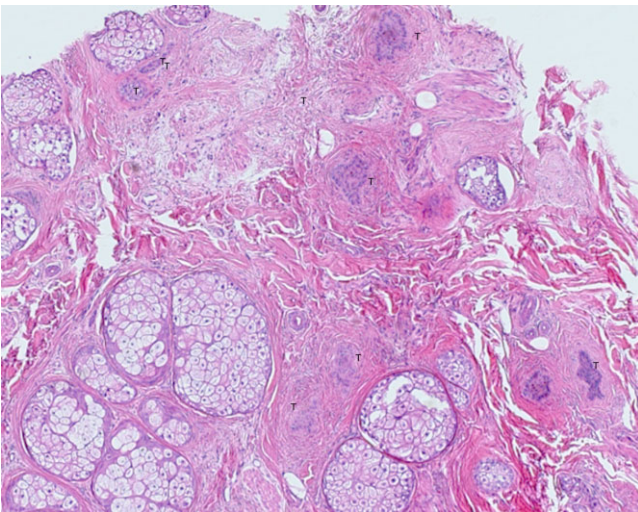


Figure 2 Histological image of a transverse scalp section prior to treatment, showing marked miniaturization of hair follicles, an elevated number of telogen follicles and the presence of fibrous tracts. Note the absence of lichenoid or sclerodermoid changes (HE, $\times 40$).

The medication was well tolerated with no reported adverse events and no changes in blood pressure or hypertrichosis in non-scalp areas. The patient reported a subjective increase in hair growth at 6 weeks. After 1 year of continuous therapy, the patient regrew significant amounts of hair, with an increased number of growing follicles as well as cosmetically meaningful lengthening of most of the scalp hairs (Fig. 3). This regrowth was continued into the second year. The regrowth in our patient was predominantly on the frontal and parietal areas.

Biopsies of the scalp were repeated 2 years post-minoxidil treatment using identical methods. Compared to the histology at baseline, there were significant decreases in telogen follicles and a reversal of follicle miniaturization, leading to substantial clinical regrowth. Changes in follicular density



Figure 3 Clinical photograph of permanent chemotherapy-induced alopecia, showing substantial regrowth of hairs after one year of oral minoxidil 1 mg daily.

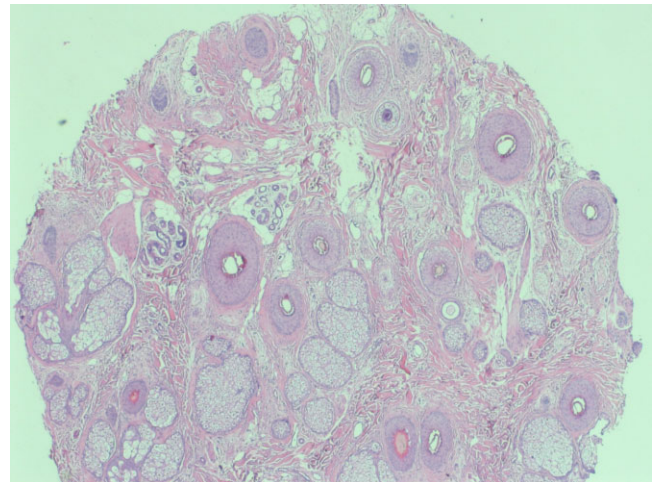


Figure 4 Histological image of a transverse scalp section 2 years post-minoxidil treatment, showing re-emergence of multiple anagen follicles and decreased number of miniaturized hairs (HE, $\times 40$).

were minimal (Fig. 4). The incomplete regrowth may be due to some follicles having been permanently damaged, represented by the fibrous tracts and reduced follicular density in the subcutis. The accelerated regrowth after 16 months of quiescence strongly suggests a treatment-induced response rather than a coincidence. The patient was very happy; she accepted our advice to continue treatment to maintain the regrowth.

No consistently effective treatment for PCIA has previously been described. Partial regrowth was reported in a pilot study of topical tellurium immunomodulator AS101 on mice and three patients, but no follow up was performed beyond 3 months.⁷ As demonstrated in our patient, PCIA may be treatable with oral minoxidil. The mechanism of action may well be the recruitment of remaining telogen

hairs into an active growth phase, similar to what has been seen in the treatment of androgenetic alopecia.⁸

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