ANAGEN EFFLUVIUM – A REVIEW

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ABSTRACT

Anagen effluvium is a type of hair loss that follows the administration of chemotherapeutic drugs, radiation treatment and various chemical agents. It is characterized by hair breakage rather than hair loss. Hair shafts break at about the same time when the thin portion reaches the scalp surface. The hair loss in anagen effluvium is quite disturbing to patients and their family members. Dermatologists have little experience with anagen effluvium.

Key Words: Anagen effluvium, Diffuse hair loss

INTRODUCTION

Anagen effluvium (AE) is a type of diffuse hair loss that follows the administration of cytotoxic drugs, radiation treatment or various chemical agents and is characterized by hair breakage rather than hair loss.¹ Anagen effluvium has an estimated incidence of 65% and is considered to be one of the most traumatic aspects of chemotherapy in female patients.² Hair shafts break at about the same time when the thin portion reaches the scalp surface. Anagen effluvium can be managed with various drugs, even if anagen effluvium cannot be prevented.¹

ETIOPATHOGENESIS

Anagen effluvium occurs during the anagen phase of growth because hair bulb cell divide rapidly and are sensitive to cytotoxic agents. Cytotoxic drugs impair the mitotic and metabolic processes in actively growing hair follicles, leading to thinning of the shaft, which becomes fragile and susceptible to fracture with minimal trauma. The molecular mechanism of AE has been associated with premature apoptosis-driven hair follicle regression, and p53, Fas and c-kit are the involved factors.¹ These agents can impair or totally disrupt the anagen cycle and cause varying degree of hair follicle dys trophy. The net result is either anagen hair that break off within the hair follicle or at the level of scalp (secondary to a weak point in the structurally inferior hair shaft) and are then shed without roots, or dystrophic anagen hair that are easily dislodged from the usual follicular moorings.³ Various causes of anagen effluvium has been presented in table 1.

Table 1: Various causes of anagen effluvium¹,⁴

<table>
<thead>
<tr>
<th>Chemotherapeutic agents</th>
<th>Alkylating agents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Melphalan, chlorambucil, busulfan, cyclophosphamide, dacarbazine, cisplatin</td>
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<tr>
<td></td>
<td>Antimetabolites</td>
</tr>
<tr>
<td></td>
<td>Methotrexate, 5-flouracil, hydroxyurea, cytarabine, 6-mercaptopurine</td>
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<tr>
<td></td>
<td>Vinca alkaloids</td>
</tr>
<tr>
<td></td>
<td>Vincristine, vinblastine, paclitaxel, docetaxel</td>
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<tr>
<td></td>
<td>Topoisomerase inhibitors</td>
</tr>
<tr>
<td></td>
<td>Topotecan, etoposide, doxorubicin, daunorubicin, idarubicin</td>
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<tr>
<td></td>
<td>Antitumor antibiotics</td>
</tr>
<tr>
<td></td>
<td>Mitomycin-C, actinomycin D, bleomycin</td>
</tr>
<tr>
<td>Ionizing radiation⁵</td>
<td>Teleradiotherapy</td>
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<tr>
<td>Nutrition⁵, ⁶</td>
<td>Marasmus, Kwashiorkar</td>
</tr>
</tbody>
</table>

CLINICAL FEATURES

Anagen effluvium is typically reversible. Severity of hair loss depends on the route of administration as well as the dose and frequency of administration. Hair shedding usually begins at 1-3 weeks after initiation of chemotherapy and becomes most clinically apparent in 1-2 months.
It most commonly affects scalp hair due to long anagen phase and to a variable degree terminal hair at other sites such as eyebrows, eyelashes, axillary and pubic hair.\(^7\)

The World Health Organization criteria for alopecia is grade 0 = no loss, grade 1 = mild hair loss, grade 2 = moderate hair loss grade 3= reversible complete hair loss and grade 4 = irreversible complete hair loss.\(^8\)

A careful history is an important key to identify triggers in any patient with diffuse hair loss.\(^9\) Anagen effluvium is a reversible condition, and hair regrowth begins several weeks after the cessation of chemotherapy. Hair loss is known to start from the area of mechanical friction such as crown and side of the head above the ears because these areas come in contact with bed linens, pillow and head covering. Nearly 85% of the total number of anagen hair are shed after chemotherapy and scalp hair those are in the telogen phase are not affected (figure 1).\(^1\) When hair regrows, approximately 65% of the patients experience a change from their previous hair. Some patients experience alteration in the colour, texture or type of hair.\(^1\)

Regrowth of hair after radiation therapy depends upon type, depth, and dose-fractionation but it commonly leads to permanent follicular destruction, most likely as a result of irreversible hair follicle stem cell damage leading to scarring alopecia. In fact, this scarring alopecia may progress long after radiation therapy has been discontinued; possibly due to persistent radiation-induced inflammatory changes that progressively damage hair follicle stem cells. Low dose cytotoxic agents more often cause only telogen effluvium, because they induce premature catagen. High dose busulfan which is used in the preparatory treatment for bone marrow transplantation may lead to permanent alopecia due to irreversible damage to hair follicle stem cells.\(^2\) In a study by Korean author Jung Yun S, 20 among the 38 female patients of anagen effluvium had patterned hair loss. They did not notice any significant difference in the pattern of hair loss depending upon age, associated symptoms and chemotherapeutic agent groups.\(^1\) Hair loss resembling androgenetic alopecia and changes in the structure and colour have been reported with tamoxifen therapy.\(^10\)

**INVESTIGATIONS**

Clinically diffuse hair loss can be diagnosed by hair pull test.\(^11\) The hair pull test is positive in anagen effluvium. Light microscopic examination shows dystrophic anagen hair (figure 2) with tapered ends and thinning or constriction of the hair shafts called Pohl-Pinkus constriction.\(^5, 10\)

**TREATMENT**

If the insult ceases, growth of hair restarts within weeks.\(^9\) Various measures have been tried in order to prevent hair loss. Topical minoxidil has been found to decrease the duration of hair loss caused by chemotherapy. Minoxidil is not effective in preventing initial hair loss due to chemotherapeutic agents. It should not be used in patients undergoing chemotherapy for hematological malignancies with a curative intent.\(^7\) Scalp cooling has been reported as an effective method of preventing chemotherapy-induced alopecia.\(^4\) It involves cooling of the scalp with cold air or liquid. It produces vasoconstriction of the scalp vessels leading to reduced blood flow to the follicles during chemotherapy thus minimizing concentration of the antineoplastic agent in plasma.\(^7\) However it may not be effective when multiple drug regimes or very high doses of individual drugs are used. There are no specific guidelines on optimal method, temperature, and duration of scalp cooling at present.\(^7\)

**CONCLUSION**

Anagen effluvium is one of the causes of diffuse hair loss. Severity of the hair loss depends on the route as well as dose and frequency of administration of chemotherapeutic drugs which is typically reversible.

**ABBREVIATION**

AE – Anagen effluvium

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**REFERENCES**


**Figure 1:** Clinical photograph showing anagen effluvium

**Figure 2:** Photomicrograph showing shed anagen hair (10X)