Review Article | Symptom Management in Palliative Medicine and Palliative Care

Hair loss: alopecia fears and realities for survivors of breast cancer—a narrative review

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Background and Objective: Breast cancer is the leading cause of cancer among women, with over 2.3 million women being diagnosed in 2022. In addition to the emotional and physical toll that comes with a new cancer diagnosis, treatments such as chemotherapies, endocrine therapies, and radiation therapies may cause undesirable side effects. Side effects from cancer treatments can be detrimental to the quality of life of patients and their support systems. This narrative review consolidates current research on the impacts of alopecia on breast cancer survivors and provides a comprehensive overview of the various preventative options and treatments available.

Methods: Current literature on alopecia and breast cancer was searched using PubMed and Google Scholar. The search strategy utilized a combination of keywords related to breast cancer, alopecia, body image, and alopecia prevention and treatment. Retrievable and English articles from January 2000 to April 2024 were included in the review.

Key Content and Findings: Women with breast cancer cited alopecia, or hair loss, as the third-most undesirable side effect from chemotherapy, only trailing behind nausea and vomiting. Other studies have further supported this notion, expressing that alopecia negatively impacts patients' body image, social functioning, and sense of self. Further research has indicated that alopecia could hinder individuals from accessing essential cancer therapies. Breast cancer patients use a variety of coping strategies for cancer treatment-induced alopecia, including preventive measures, treatments to accelerate hair regrowth, camouflaging tools, and psychosocial supports.

Conclusions: Alopecia, as a result of cancer treatment, has many significant and distressing effects on breast cancer patients. Customized interventions may help breast cancer patients feel more comfortable about themselves, after experiencing chemotherapy-induced alopecia. These findings indicate the need for further research on preventative options and treatments for cancer treatment-induced alopecia.

Keywords: Alopecia; breast cancer; body image; alopecia management

Submitted Apr 16, 2024. Accepted for publication Jul 09, 2024. Published online Aug 05, 2024.
doi: 10.21037/apm-24-69
View this article at: https://dx.doi.org/10.21037/apm-24-69

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Introduction

Breast cancer is one of the most diagnosed cancers worldwide, with an estimated 2.3 million new cases of breast cancer in 2022 (1). In addition to its incidence, breast cancer is also the leading cause of cancer death in the global adult female population (2). Most breast cancer patients will receive adjuvant chemotherapy after undergoing primary surgery to target micrometastatic disease and help decrease the risk of recurrence (3). Various chemotherapy agents such as doxorubicin, cyclophosphamide, and docetaxel are used, however, these chemotherapeutic agents often result in various severe side effects, such as nausea, vomiting, weakness, loss of appetite, and alopecia (4). Following management with combinations of chemotherapy, surgery or radiation, it is common for patients with breast cancer that is hormonally positive, such as estrogen receptor (ER), progesterone receptor (PR) or human epidermal growth factor receptor 2 (HER2) to be prescribed 5–10 years of endocrine therapies. For patients who are prescribed endocrine therapies, they may experience alopecia as a direct result of their endocrine therapy, such as selective estrogen receptor modulators (SERMs), gonadotropin-releasing hormone (GnRH) antagonists, and aromatase inhibitors (5-7).

The aim of this study is to consolidate current research on the impacts of alopecia on breast cancer survivors, as well as provide a comprehensive overview of the various preventative options and treatments available. We present this article in accordance with the Narrative Review reporting checklist (available at https://apm.amegroups.com/article/view/10.21037/apm-24-69/rc).

Methods

Current relevant literature on breast cancer and alopecia was identified via searches from February to April 2024. PubMed and Google Scholar were searched to identify papers focused on breast cancer, hair loss, body image, and treatments for alopecia. The keywords used in the search included (breast cancer) AND (alopecia) OR (hair loss) OR (body image) OR (alopecia prevention) OR (alopecia treatment). The search was conducted by 3 individual researchers (M.P., L.R., L.K.), and consensus was reached by a fourth researcher (B.D.). Articles were chosen in the time frame of January 1990 to March 2024. Articles were included in the narrative review if they were retrievable and in the English language. Evidence was then sorted into types of alopecia, impacts of alopecia on body image, alopecia as a barrier to care, and management of alopecia (*Table 1*).

Results

Types of alopecia

Chemotherapy-induced alopecia (CIA)

CIA is a significant side effect of breast cancer therapies (8). In one study, 55% of breast cancer patients reported high psychological stress due to CIA (9). Distress due to CIA has been found to be strongly associated with depression, lower body image, health status, and psychosocial well-being. CIA has been ranked among the top three most reported side effects of breast cancer therapies, only following nausea and vomiting (10). In one study, women cited alopecia as the single most emotionally-distressing side effect from chemotherapy (11). CIA influences how others perceive cancer patients and how obvious the disease is. CIA also impacts patients' social relationships and sexuality (12). CIA occurs because cytotoxic chemotherapeutic agents target rapidly proliferating cells, including those in hair follicles. The occurrence and severity of CIA depend on the dose of chemotherapy administered and the administration schedule (13). Alopecia is especially prevalent in patients receiving taxane-based chemotherapy (5).

In patients with who are starting chemotherapy infusions, CIA typically occurs within 1–3 weeks of the first cycle of chemotherapy, then further progresses with additional cycles. On physical examination, CIA may occur in the frontal region of the scalp (androgenetic-like) or be diffuse or patchy in its distribution. In addition to a decrease in overall hair density, associated symptoms such as scalp pruritus and discomfort may also be present (14).

Chemotherapeutic agents also act on hairs of the eyebrows and eyelashes. Of 524 breast cancer patients who were surveyed, 47% reported noticing eyelash loss or eyebrow loss (14). A separate study that included 1,478 breast cancer patients found that 88% and 90% of patients reported some degree of eyelash and eyebrow loss, respectively (10).

Though hair regrowth typically occurs within 6 months of completing chemotherapy, there have been studies demonstrating permanent or persistent CIA (pCIA). pCIA is defined as incomplete hair growth recovery 6 months following the completion of chemotherapy treatments. Although pCIA can occur with various chemotherapy regimens, it is dose- and schedule-, and regimen-related. Certain chemotherapeutic agents have been associated with heightened risks for causing hair loss. In particular, taxanes, such as docetaxel and paclitaxel, have been correlated with higher percentages of patients experiencing pCIA.

Table 1 The search strategy summary

Items	Specification
Date of search	February 2024 to April 2024
Databases and other sources searched	PubMed, Google Scholar
Search terms used	(breast cancer) AND (alopecia) OR (hair loss) OR (body image) OR (alopecia prevention) OR (alopecia treatment)
Timeframe	January 2000 to April 2024
Inclusion criteria	Articles were selected if they were retrievable, were in the English language and were focused on alopecia and/or breast cancer survivors
Selection process	Conducted by three individual researchers (M.P., L.R., L.K.), consensus was reached by a fourth researcher (B.D.)

The risk of pCIA is higher in patients who have received chemotherapy regimens containing docetaxel at doses of 75 mg/m^2 or higher per cycle (15). A study performed in Seoul, Korea, found that 39.5% of patients receiving paclitaxel-based chemotherapy regimens had pCIA at 6 months after chemotherapy completion (16).

In addition to taxane-containing chemotherapy regimens, anthracyclines are also associated with high rates of hair loss. This heightened risk of hair loss is best exemplified by studies showing that patients receiving anthracyclines are more resistant to efforts to mitigate CIA, such as scalp cooling (17,18). One study found that longer post-chemotherapy infusion scalp cooling times were needed to prevent significant CIA (19).

Endocrine-induced alopecia (EIA)

In addition to alopecia occurring due to cytotoxic agents, it can also occur secondary to endocrine therapies including aromatase inhibitors and tamoxifen. Patients with hormone receptor-positive breast cancer receive an average of 5 to 10 years of endocrine therapies to decrease the risk of breast cancer recurrence (6-8). Within 12 months of the initiation of an endocrine therapy, 43–58% of patients reported noticing significant alopecia (6,8). A striking 8.3% of patients reported discontinuing an aromatase inhibitor early solely due to experiencing alopecia (20), thus there is a great need for increased support for patients who experience alopecia within their first few years of therapy.

On physical examination, EIA appears similar to female pattern hair loss, or androgenetic alopecia, with diminished density on the frontal and parietal areas on the scalp. Endocrine therapies work to block estrogens, thereby increasing the relative levels of androgens including testosterone. Testosterone is known to cause hair loss by shortening the anagen phase, or growing phase, of hairs. In addition, testosterone causes miniaturization, or a decreased diameter, of hair follicles (21).

Cyclin-dependent kinase 4 and 6 inhibitors (CDK4/6i) are novel targeted therapies increasingly used in patients with breast cancer. To date, two randomized-controlled clinical trials (CCTs) have reported alopecia as an adverse effect of CDK4/6 agents (22,23). In a cohort study that included 10 patients receiving CDK4/6i, 70% of patients had alopecia on the vertex scalp, which differs from the alopecia pattern seen in women with EIA. Furthermore, CDK4/6i-alopecia (CDKIA) had a faster onset compared to EIA (24).

In patients receiving both an endocrine therapy and a CDK 4/6i, alopecia can be less responsive to prescription hair loss treatments, such as minoxidil. When treated with low-dose oral minoxidil (LDOM) for 16–24 weeks, moderate to significant improvement of alopecia occurred in 80% of CDKIA patients versus 94.4% of EIA patients (24).

Body image

One of the major negative outcomes of alopecia is the impact it has on the quality of life (QOL), including the self-image and self-esteem, of breast cancer patients and survivors. In qualitative studies, women with breast cancer reported alopecia was associated with a loss of privacy as it made those around them aware that they were receiving chemotherapy. Women also reported alopecia was a visible reminder that they were experiencing cancer. Some women reported that alopecia negatively affected their social activities and interactions, while also causing

apprehension about returning to work (25,26). Women reported changes in self-esteem and perception about themselves and a decrease in sensuality and sexuality due to alopecia. Conversely, for a minority of women, alopecia was perceived positively as a sign that the chemotherapy was effective (25).

In a qualitative meta-synthesis performed by Kocan *et al.*, two major themes were found regarding the sentiments about CIA in breast cancer patients: "I am not comfortable in this body" and "Who am I?" (27). This demonstrates the effect of CIA on patients with breast cancer, affecting their body image and self-perception, as well as generating fears of losing themselves and their partners. In another study, women with breast cancer undergoing chemotherapy were interviewed regarding their experiences with breast cancer. The experience of alopecia was emphasized by patients as being primarily responsible for their alterations in self-image during chemotherapy. One patient said: "*It's weird, if you look at the mirror and see yourself without your hair, you lose some of your identity*." (2).

In a 2012 study by Kim *et al.* in Seoul, Korea, semi-structured in-depth interviews were performed with patients who were expected to experience or had experienced alopecia. Most participants described alopecia as a traumatizing experience and patients reported that they found it difficult to look at themselves in the mirror because of their hair loss. Patients also admitted their main concern was hiding alopecia from those around them so that they would not be perceived negatively by others (26). On a positive note, many participants felt that their difficulties was gone once they saw their hair growing again (26).

The image a woman has of herself is subjective and corresponds to her identity. Therefore, it is important for healthcare professionals to understand the changes in self-perception that occur in patients with breast cancer who experience alopecia. Customized interventions may help women feel more comfortable about themselves, after experiencing CIA (2).

Fear of alopecia as a barrier to care

Some studies report alopecia as a barrier to receiving cancer treatment, specifically chemotherapy. Alopecia is one of the side effects of cancer treatment that patients fear the most, and up to 14% of patients refused chemotherapy due to the fear of losing their hair (28). Additionally, 8.3% of patients reported discontinuing endocrine therapy solely due to the alopecia they experienced (20). In yet another study, alopecia was reported as a notable burden to nearly half of scalp cooling patients and 10.8% of patients hesitated when deciding whether to receive chemotherapy or not (29).

Conversely, in a study performed by Kim *et al.*, none of the patients refused chemotherapy because of alopecia, as the fear of recurrence of breast cancer was greater than the effect they expected from alopecia (26). However, after experiencing alopecia, the attitudes of patients changed. Patients reported that alopecia was a very traumatizing and painful experience beyond their imagination. One patient who received additional chemotherapy because of breast cancer recurrence said she hesitated to receive a second course of chemotherapy after experiencing alopecia (26). This demonstrates that alopecia continues to be a barrier to cancer care, either initially or when additional treatment is required.

Management of alopecia

Preventative options—scalp cooling

One widespread approach to prevent alopecia is scalp cooling, which utilizes static devices such as cold caps or a dynamic scalp cooling machine (uses refrigeration to circulate fluid in a cooling cap). In either approach, a chilled cap is placed on the patient before chemotherapy begins. With static scalp cooling, the cap is changed throughout treatment. Conversely, with dynamic cooling, the cap does not need to be changed or removed until the treatment is finished (30). Scalp cooling promotes cutaneous vasoconstriction in the scalp, which reduces blood flow to the hair follicles and decreases the uptake of chemotherapeutic agents (12,31). It is also hypothesized that scalp cooling reduces biochemical activity, making hair follicles less susceptible to chemotherapy-induced damage (30).

A clinical trial tested the safety and effectiveness of the Orbis Paxman Hair Loss Prevention System, a scalp-cooling device, in reducing CIA in women with breast cancer. The results demonstrated that women with breast cancer undergoing chemotherapy with a taxane, anthracycline or both agents were significantly more likely to have less than 50% hair loss if scalp cooling was used (30). In another review that analyzed controlled clinical trials (CCTs) and randomized controlled trials (RCTs) conducted to date, scalp cooling effectively reduced the occurrence of CIA by 2.7- and 3.9-fold in the CCTs and RCTs, respectively (32). However, it is unclear whether treatment with scalp cooling reduces the risk of pCIA (33).

Furthermore, a retrospective review investigated how

various factors affect patients' decisions to utilize scalp cooling treatments. Patients' age, race, insurance status, and chemotherapy regimen were found to be predictors of their likelihood to undergo scalp cooling. Younger patients and those with private insurance were more likely to opt for scalp cooling. Compared to White patients, non-White patients were less likely to choose scalp cooling. Additionally, patients placed on the chemotherapy regimen of AC [doxorubicin hydrochloride (adriamycin) and cyclophosphamide] or AC-T [doxorubicin hydrochloride, cyclophosphamide, and paclitaxel (taxol)] were less likely to opt for scalp cooling than patients on PTCH/TCHP [docetaxel (taxotere), carboplatin, trastuzumab (herceptin) and pertuzumab (perjeta)] or TC [docetaxel and cyclophosphamide (cytoxan)] regimens (34).

There are fears that scalp cooling can increase the risk of scalp metastasis, which is a rare site of metastatic disease in breast cancer. However, a systematic review and meta-analysis performed by Rugo *et al.* found that there was no statistical difference in the incidence of scalp metastasis between patients who used scalp cooling compared to those who did not (35).

An area that needs to be further researched is the prevention of CIA in Black patients as there is limited data on the efficacy of scalp cooling in this population. There is a need for physicians to better understand Black kinky or curly hair, its properties, and how styling curly hair differs from styling straight hair. Even though straight hair and curly hair have identical chemical properties, they differ in physical properties, including shape, texture, and density. This may require further consideration in the instructions given to patients for preparing their hair before using scalp cooling devices (36). In computer models, hair texture, especially hair thickness, has been shown to have an inverse relationship with the ability of the cap to effectively cool the scalp. This is because the cap must be in direct contact with the scalp to be effective. This poses a challenge when certain textures of Black hair become curlier and thicker when wet (37). Additionally, curly hair is often altered to a greater extent compared to straight hair when heat and chemicals are added, such as chemical straightening or topical oils, which can affect the effectiveness of scalp cooling for Black patients (36). To prevent Black patients from missing the benefits of scalp cooling, we urge further research on the optimal protocol for the application of scalp cooling devices in Black patients.

Another area in need of further research pertains to the efficacy of scalp cooling in patients of Asian race. In one study of female Japanese breast cancer patients, 45.6% of patients who used scalp cooling therapy throughout chemotherapy infusion visits experienced Dean Score Grade 3 alopecia, comparable with scores of White women (38). We emphasize the importance of further research regarding racial differences in efficacy of scalp cooling technology to ensure that patients of all races can benefit from its use.

Other preventative options

Several other preventative options for CIA have been suggested and researched, however, many have not been approved yet.

Topical vasoconstrictors

One preventative option is topical vasoconstrictors. Topical vasoconstrictors, such as epinephrine and norepinephrine, have been shown to prevent CIA in rats (39,40). Hypoxia signal induction by local vasoconstriction reduces the amount of drug that reaches the hair follicles, and preserves the hair follicles (40,41). However, to date, topical vasoconstrictors have only been effective in protecting against CIA in animal models (15). A major benefit of vasoconstrictors over scalp cooling is that they can be applied whenever needed, whereas scalp cooling can only be administered during infusion. The half-life of chemotherapeutic drugs is longer than their infusion time, hence, scalp cooling is unable to prevent toxic effects in subsequent days or weeks following infusion. Furthermore, patients who are not good candidates for scalp cooling can opt for topical vasoconstrictors instead (15,40).

Vitamin D/calcitriol

Another preventative option is vitamin D which has important anti-inflammatory and immunomodulatory properties (42). It is also believed that vitamin D stimulates hair growth and anagen initiation, and various types of alopecia have been closely linked to deficiency of vitamin D (42,43). In one study, calcitriol, an active form of vitamin D, was applied to the scalps of 23 female breast and gynecologic cancer patients receiving a taxane-based chemotherapy. At week 7, a reduction of alopecia of >50% was observed in 8 patients (44). To maximize effects, it has been suggested that topical application of calcitriol can be replaced by systemic administration, due to its effects on hair follicle morphogenesis. This may enhance the effects of simultaneous topical application of minoxidil and/or prostaglandin analogues (40,45,46).

Keratinocyte growth factor (KGF)

KGF, also known as fibroblast growth factor 7 (FGF7), is a potent mitogen that protects epithelial cells from damage

Table 2 Treatment options for regrowth of hair following alopecia

Agent	Mechanism of action	Mode	Special considerations
Minoxidil	Lengthens anagen (growing) phase	Oral or topical (foam, solution)	For oral minoxidil, patients should be counseled on the risk of reduced blood pressure and cardiovascular risk (50)
Spironolactone	Inhibits androgens (i.e., testosterone)	Oral or compounded topically	Oral spironolactone was previously believed to increase the occurrence of tumors and was not traditionally recommended for patients with a personal history of breast cancer. The FDA has now removed this effect (51,52)
Dutasteride/Finasteride	Inhibits 5-alpha reductase to block the formation of testosterone	Oral or compounded topically	Not recommended in pre-menopausal women (53)
Prostaglandins	Stimulation of prostaglandins E2 and F2	Topical	Patients should be counseled on the risk of darkening of irises (in the eyes), if applied to eyelashes (54)
Platelet-rich plasma	Growth factors in plasma promote hair growth	Injections on scalp	Considered a cosmetic treatment, so patients must pay out-of-pocket; limited studies including patients who have experienced hair loss secondary to cancer treatments (55)
Photobiomodulation or low-level laser therapy	Reduction of cell death in hair follicles; lengthening of anagen (growing) phase (56)	Laser therapy	Considered a cosmetic treatment, so patients must pay out-of-pocket

FDA, Food and Drug Administration.

caused by stressful conditions (15,47). Various studies have demonstrated the efficacy of KGF. In one study, intradermal injections of a bioengineered hair formulation that contained various growth factors, including KGF, into the scalp resulted in significant reduction in hair loss (48). Additionally, in human scalp hair follicle organ culture, KGF pretreatment slightly, but significantly, inhibited hair follicle apoptosis and dystrophy caused by 4-hydroperoxycyclophosphamide (4-HC), which is a key cyclophosphamide metabolite (49).

Regrowth options

Several treatment options exist for patients who seek to promote regrowth of hair following alopecia. The most common treatment options have been highlighted in this table (*Table 2*).

An emerging therapeutic option is photobiomodulation (PBM). Research has shown the effectiveness of PBM in accelerating hair regrowth after chemotherapy in breast cancer patients. A randomized controlled trial with breast cancer patients who received anthracycline and taxane-containing chemotherapy was performed in Belgium, which found significantly higher hair regrowth 1 month after chemotherapy with PBM compared to those who did not use PBM. The PBM treatment group also scored their global health as significantly higher compared to the control group at all time points in the trial. Therefore, PBM is showing promise as a treatment option to accelerate hair regrowth after chemotherapy in breast cancer patients, while improving the global health status and body image of breast cancer patients (57).

Minoxidil is a topical or oral medication that acts as a vasodilator, inducing angiogenesis and extending the hair's anagen (growing) phase while shortening the telogen (quiescent) phase (15). Minoxidil has been used off-label to treat CIA, and studies have shown its effectiveness at shortening the alopecic period (15) and promoting hair regrowth following CIA (58) in both topical and oral forms (59). Minoxidil should be used only following discontinuation of chemotherapy (40). Other considerations specific to oral minoxidil include counseling for potential hypertrichosis and lower extremity edema (60).

Spironolactone is a synthetic aldosterone receptor antagonist with antiandrogenic properties that is used off-label to treat a variety of dermatologic conditions (61). Patients treated with oral spironolactone in combination with topical minoxidil have demonstrated moderate to significant improvement in CIA (62) but there are limited studies supporting the efficacy of spironolactone. Concerns regarding the risk of stimulation of hormone receptor-positive tumors by spironolactone represent an important area for future study, as data is limited regarding safety in

patients affected by these cancers (51), and side effects such as dizziness, breast tenderness, and menstrual irregularity have been reported (61).

5-alpha reductase inhibitors, such as finasteride and dutasteride, may be prescribed off-label for use in alopecia (63). Although generally well tolerated by female patients, special considerations regarding the use of 5-alpha reductase inhibitors include limited safety data for use in patients with hormone receptor-positive cancers and side effects such as decreased libido, headache, and abdominal discomfort (64).

Prostaglandin F2 alpha analogs such as bimatoprost may be used to treat eyelash hypotrichosis and eyelash, eyebrow, and scalp alopecia (15). Studies have demonstrated efficacy of topical bimatoprost for increasing rate of hair regrowth and increasing density of eyelashes (65). Although adverse effects such as darkening of the irises of the eyes (65), conjunctival hyperemia, and eye pruritus have been reported, these effects are typically mild and reverse with cessation of treatment (64).

Platelet-rich plasma (PRP), also known as autologous platelet concentrates, is a concentrate of PRP proteins. Centrifugation, and sometimes sonication, is used to remove red blood cells and a portion of plasma, thereby producing PRP (64). PRP has been used for a variety of medical purposes to promote healing, tissue regeneration, and cell proliferation, including in alopecia treatment. Although PRP treatment is minimally invasive and relatively low cost, there are limited studies demonstrating its efficacy, particularly among patients with CIA (15).

Camouflaging options

Wigs or other head covers are a common concealment strategy for patients with CIA. One study that used a questionnaire to analyze the usage of wigs among patients with CIA reported that all patients used at least one type of hair cover, including wigs, scarfs, caps, and hats, with most patients using more than one type. Wigs were the most frequently used type of head cover, with 81% of patients using this concealment strategy. Overall, patients reported satisfaction with their wigs, stating that their wigs looked a lot like their own hair and fit nicely on their scalp. However, patients also reported that their wigs were expensive and that they were constantly aware that they were wearing a wig (66).

Other camouflage strategies that may be used by patients with CIA are pigmented concealing fibers, powders, and sprays. Topical hair fibers comprised of positively charged wool or rice, keratin, rayon, or human hair adhere to negatively charged vellus or terminal hair fibers on the scalp, decreasing the contrast between existing hair and the scalp. One downside of this camouflage method is that the topical hair fibers require existing hairs to bind, so they are ineffective on bald areas. Similarly, powder cakes and sprays are other camouflage techniques that may be applied daily to decrease the color contrast between the patient's hair and scalp. Limitations of both methods include that they require daily application and are washable, so they may be distorted by activities that cause them to get wet (67).

Another emerging concealment strategy is a personalized scalp prosthesis, that reproduces the patient's original hair while allowing the device to be resistant to everyday activity (68).

Psychosocial support

Many patients with CIA report high levels of depression, anxiety and low self-esteem (69,70), demonstrating the importance of psychosocial support for patients with alopecia. Mental health screening can help patients navigate the psychosocial impacts of alopecia (71,72). Various interventions have been shown to decrease the psychological burden faced by patients, including mindfulness-based stress reduction (MBSR), collocated behavioral health (CLBH) treatment, hypnotherapy, psychoimmunotherapy, cognitive behavioural therapy and coping strategies (71-74). A systematic review by Maloh *et al.* found that MBSR improved QOL, relationship impacts, anxiety, phobia, distress, and psychological symptom intensity in patients with alopecia. Additionally, hypnotherapy decreased anxiety and depression in patients with alopecia. Interestingly, psychotherapy combined with immunotherapy resulted in more hair growth, and supported patients' self-confidence (73).

Another strategy for managing CIA is the appearance care program (ACP). This strategy aims to help patients with anticipatory coping, by preparing for the expected alteration in appearance after chemotherapy. This program aims to allow women to have a greater sense of control over their changing appearance. A study that tested the effectiveness of ACP found that although most participants experienced hair loss after one month of the program, their QOL improved. One month after the program, emotional well-being continued to increase while social and functional well-being remained consistent. Participants felt empowered by the information they learned during the program and valued the intimate support they experienced from group

members in the program facing a similar situation (75).

Conclusions

CIA represents one of the most significant and distressing side effects of treatment among breast cancer patients. The change in appearance caused by CIA has been shown to negatively impact breast cancer patients' perceptions of their identity, privacy, sexuality, and self-esteem, as well as their perception of treatment for recurrent disease. Many breast cancer patients practice avoidance and concealment behaviors to avoid the stigma associated with a cancer diagnosis or alopecia, and a variety of preventive and treatment options for CIA have emerged in recent years. Patients use scalp cooling to prevent CIA, PBM to accelerate hair regrowth after chemotherapy, camouflaging options such as wigs or other head covers, pigment sprays and hair powders to conceal CIA, and ACP to prepare for and cope with CIA. Healthcare providers should understand the negative effects of CIA for breast cancer patients in order to best support their patients during treatment and provide them with proper coping resources.

Acknowledgments

Funding: None.

Footnote

Provenance and Peer Review: This article was commissioned by the editorial office, *Annals of Palliative Medicine*, for the series "Supportive Care After Breast Cancer: Challenges and Opportunities". The article has undergone external peer review.

Reporting Checklist: The authors have completed the Narrative Review reporting checklist. Available at https://apm.amegroups.com/article/view/10.21037/apm-24-69/rc

Peer Review File: Available at https://apm.amegroups.com/article/view/10.21037/apm-24-69/prf

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://apm.amegroups.com/article/view/10.21037/apm-24-69/coif). The series "Supportive Care After Breast Cancer: Challenges and Opportunities" was commissioned by the editorial office without any funding or sponsorship. E.Z. and M.A. served as the unpaid Guest Editors of the series. B.D. is a consultant for Novocure and serves on the Data Safety and Management Board of Hoth Therapeutics. The authors have no other conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Cite this article as: Peera M, Rose L, Kaufman L, Zhang E, Alkhaifi M, Dulmage B. Hair loss: alopecia fears and realities for survivors of breast cancer—a narrative review. Ann Palliat Med 2024;13(5):1235-1245. doi: 10.21037/apm-24-69