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Impact of scalp cooling on chemotherapy-induced alopecia, wig use and hair growth of patients with cancer

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A B S T R A C T

Introduction: Cytotoxic therapy for patients with cancer frequently induces reversible, but long-lasting alopecia which might be prevented by scalp cooling. This study evaluates the effectiveness of scalp cooling with respect to the severity of chemotherapy-induced alopecia (CIA) and the purchase and use of wigs and head covers.
Materials and methods: In this observational study, scalp-cooled patients ($n = 160$) were compared with non scalp-cooled patients ($n = 86$) with several types of cancer. Patients were enrolled in 15, mostly general hospitals prior to taxane and/or anthracycline-based chemotherapy. Patients completed four questionnaires between the start and one year after the last chemotherapy.
Results: Severity of CIA, and purchasing and actually wearing wigs and head covers were significantly lower among scalp-cooled than non scalp-cooled patients. Overall, scalp cooling reduced the use of wigs and head covers by 40%. Among 84 scalp-cooled patients who purchased a wig (53%), only 52 patients actually wore it (62%), and they just wore it intensively (86% daily) for less than six months (80%). Especially young patients camouflaged CIA with a head cover instead of a wig.
Discussion: The relatively long duration of CIA, the wish of many patients to camouflage or rather prevent it and the 40% reduction for head covering by scalp cooling, makes it a worthwhile supportive intervention. However, (cost-) effectiveness can be improved. Many scalp-cooled patients purchased a wig unnecessarily.

Introduction

Alopecia is a common side-effect of systemic cancer treatment. Even before patients commence chemotherapy, they foresee a high psychological impact at the moment hair loss actually occurs (Hurk van den et al., 2010), and it appears in fact to be distressing for many patients (Frith et al., 2007; Hilton et al., 2008; McGarvey et al., 2001; Rosman, 2004; Tighe et al., 2011; Williams et al., 1999). In a breast cancer focus group, organised by the authors, patients reported that their personal identity disappeared simultaneously with the sudden hair loss: "*You don't recognise the person in the mirror anymore, although you have known that person your whole life*". At that moment patients feel labelled as a cancer patient and state that "*If you look ill, you feel more ill*". CIA is an outward sign of cancer – it makes cancer visible. It reminds patients and their relatives continuously about cancer and it's treatment: "*On good days between chemotherapies, you don't think about the disease… until you look in the mirror*".

Severe chemotherapy-induced alopecia (CIA) occurs mostly within three weeks of the first chemotherapy cycle (Batchelor, 2001; Trueb, 2009). While cytostatics mainly influence anagen hair follicles (Cotsarelis and Millar, 2001), i.e. in the growth phase, the growth of hairs is diminished until some weeks to months after the last chemotherapy cycle (Batchelor, 2001; Trueb, 2009). Alopecia-inducing chemotherapy schedules continue for at least nine weeks, but more often up to 21 weeks (Oncoline, 2012), so

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patients often have to deal with a bald head or short hair for up to about nine months. It may take some additional time before patients have their usual appearance again, because when hair grows back, the structure is often temporarily different from the hair they used to have (Batchelor, 2001).

Many patients camouflage CIA by wearing a wig or head cover. Wearing a wig is a compensation for the changed appearance and makes the patient look normal again. However, some patients prefer not to hide hair loss and share their baldness (Williams et al., 1999).

CIA is however not inevitable. Scalp cooling is a supportive care intervention that overall prevents severe CIA in about half of the patients, who otherwise would have lost their hair (Hurk van den et al., 2012b). Its effectiveness has been shown in 6 out of 7 randomised studies with several types of chemotherapy, published between 1977 and 2003 (Grevelman and Breed, 2005). An overview of the results after 40 years of scalp cooling has been provided in recent reviews (Breed et al., 2011; Grevelman and Breed, 2005). These reviews however show a broad diversity in CIA evaluation methods.

This study evaluates the effectiveness of scalp cooling by comparing severity of CIA and the purchase and use of wigs and head covers between scalp-cooled and non scalp-cooled patients. Furthermore, the duration of CIA is taken into consideration.

Methods

Patients and setting

In this observational prospective study scalp-cooled patients were compared with non scalp-cooled patients. Patients were treated in 13 hospitals which used scalp cooling and two which did not. Patients in the participant scalp cooling hospitals who did not want scalp cooling, could participate in the non scalp-cooled group. Patients were eligible if they received a chemotherapy schedule with the potential of inducing severe CIA and for which scalp cooling was commonly applied. They had to be at least 18 years old and had to understand the Dutch language. Exclusion criteria for scalp cooling were baldness before the start of chemotherapy, haematological malignancies with generalised metastases, clinical signs of scalp skin metastases, cold sensitivity, cold agglutinin disease, cryoglobulinaemia, cryofibrinogenaemia and cold post-traumatic dystrophy.

Scalp cooling was performed using the Paxman system (type PSC1 or PSC2) with a standardised cooling time from 30 min before starting the chemotherapy infusion to 90 min after stopping the infusion.

Approval for this study was obtained from the Medical Ethics Committees and all participating patients signed forms of informed consent.

Measures

Patients received four sets of questionnaires with return envelopes and completed them at home before the start of chemotherapy (M1) and three weeks (M2), six (M3) and twelve months (M4) after completing chemotherapy. If the questionnaires were not returned in time, patients received a reminder. Patients were eligible for analysis if they completed at least the first and second questionnaire. Clinical patient characteristics were collected from patient files.

Patients evaluated in M2 the severity of CIA as defined by the World Health Organisation (WHO) scale for alopecia: grade 0 for none, grade 1 for mild, grade 2 for pronounced and grade 3 for total alopecia (World Health Organisation, 1979). Furthermore, patients filled in a Visual Analogue Scale (VAS) ranging from 0 (for no alopecia) to 100 (for total baldness).

Patients reported whether they had purchased (M1, M2, M3) and used (M2, M3, M4) a wig or head cover and during what time period (M3 and M4). They also stated whether they had used it inside or outside of the home. In addition, they reported when their hair started to grow again (M3) and whether they were satisfied with their hairstyle 3 weeks and 6 months after the last chemotherapy cycle (M2, M3).

Statistics

The Chi-square test was used to compare the proportion of scalp-cooled and non scalp-cooled patients with respect to demographics and clinical characteristics, purchase and use of wigs or head covers, WHO scores, and growth of hair. VAS for CIA was compared between scalp-cooled and non scalp-cooled groups with the standard *t* test for unequal variances. Associations between the outcome measures were tested by the Spearman's rank correlation test, using the SAS computer package (version 9.1, SAS Institute Inc., Cary, North Carolina, USA, 1999).

Results

Patients and setting

In this observational study 160 scalp-cooled and 86 non scalp-cooled patients were available for analysis (Fig. 1). Only six men were included, all underwent scalp cooling (Table 1). The majority of patients had a Dutch ethnicity (96%), had breast cancer (93%), were treated in the adjuvant setting (87%) and had oncological surgery (93%). Scalp-cooled patients received FEC chemotherapy (5-Fluorouracil, Epirubicin, Cyclophosphamide) more often than those who did not undergo scalp cooling. Scalp-cooled patients received a mean of six (range 1–27) chemotherapy cycles and five (range 1–27) scalp cooling cycles. Non scalp-cooled patients received a mean of six (range 3–16) chemotherapy cycles, and 56% of them were treated in the two hospitals that did not offer scalp cooling.

All four measurements were complete in 76% of the patients (Fig. 1). Reasons for incompleteness ($n = 59$) were: 75% unknown, 17% died, 3% missing patient identification (impossible to send a reminder) and 5% actively discontinued participation. Compliance with scalp cooling was high, only four patients (3%) stopped it because of intolerance, others stopped only because of CIA. No scalp skin metastases were reported from the inclusion of patients in 2007 and 2008 until January 2012.

Severity of CIA

Hair loss was significantly less pronounced in scalp-cooled than in non scalp-cooled patients ($p < 0.0001$) (Table 2). Mean VAS scores and proportion head cover use increased when categories of WHO scores increased. Correlation coefficients were 0.86 for VAS versus WHO, 0.63 for WHO versus head cover use and 0.65 for VAS versus head cover use. Scalp-cooled patients with pronounced CIA on the WHO scale reported that they had lost half of their hair (VAS 52) and overall 45% of them did use a head cover.

Purchase and use of wigs and head covers

Purchase and use of wigs and head covers differed significantly between scalp-cooled and non scalp-cooled patients (Table 3). Overall, scalp cooling reduced the use of a wig or head cover by 40% ($p < 0.0001$). Among 84 scalp-cooled patients who purchased a