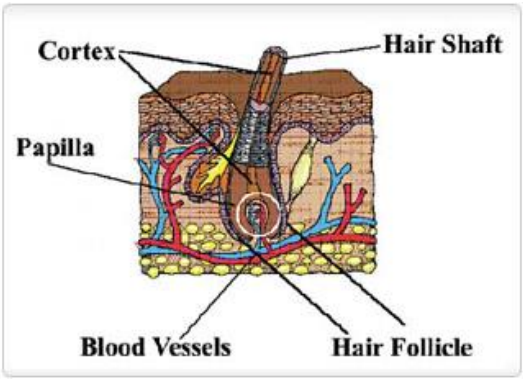
# Cancer Association of South Africa (CANSA)

CANSA Fact Sheet
on
Scalp Cooling to Help Minimise Hair Loss

**Introduction**

Hair grows from a single follicle - an indentation in the skin. Each hair follicle has its own blood, nerve and muscle supply. Every individual is born with a specific number of follicles, which cannot be changed, and the size of one's hair follicle determines the thickness of one's hairs.



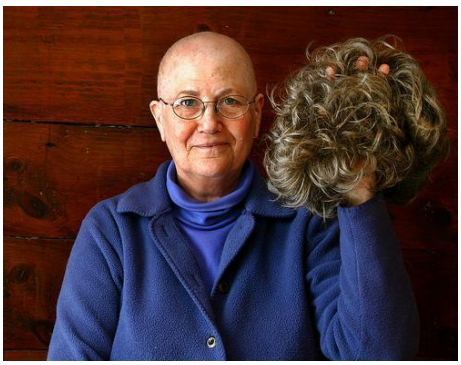

[Picture Credit: Hair Follicle]

At the base of each follicle, lying on the dermis (the deeper layer of the skin), is the papilla – the bud of hair where most growth takes place. The blood vessels that surround follicles carry the nourishment one's hair needs to grow. This is one of the reasons why diet is so important for healthy hair growth and strength.

When blood vessels in the scalp are cooled, they become narrower, and so less blood flows through them. Cooling the scalp during chemotherapy means that less of the chemotherapy drug reaches the hair follicles. This means the hair is less likely to fall out.

**Loosing Hair Following Chemotherapy**

Chemotherapy drugs are powerful medications that attack rapidly growing cancer cells. Unfortunately, these drugs also attack other rapidly growing cells in the body - including those in the hair roots.



[Picture Credit: Hair Loss]

Chemotherapy may cause hair loss all over the body - not just on the scalp. Sometimes even the eyelashes, eyebrows, armpits, pubic and other body hair also fall out. Some chemotherapy drugs are more likely than others to cause hair loss, and different doses of chemotherapy drugs can cause anything from a mere thinning of hair to complete baldness.

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Many believe that only women suffer hair loss because of certain chemotherapy drugs – men can also suffer hair loss because of cancer treatment.

[Picture Credit: Chemotherapy-induced Hair Loss in Men]

Fortunately, most of the time hair loss from chemotherapy is temporary. One can expect one's hair to regrow three to ten months after chemotherapy treatment ends, though the hair may temporarily be a different shade or texture.

The loss of hair that comes as a side effect of many chemotherapy agents can be a devastating part of cancer treatment. Some patients see it as not just a blow to their vanity, but as a constant, visual reminder of their illness.

Hair loss is one of the most well-known side effects of cancer treatment. Some cancer drugs may cause:

- Mild thinning of hair
- Partial hair loss, or loss of patches of hair
- Complete hair loss (alopecia)

Generally, chemotherapy is the type of cancer treatment most likely to cause hair loss. Complete hair loss is very unlikely with any other type of cancer treatment. But some other cancer drugs can cause hair thinning. One cannot tell beforehand who will be affected or how badly someone may be affected by chemotherapy drugs. Some drugs are more likely to cause hair loss than others.

Hair loss also depends on other factors such as:

- The type of drug or combination of drugs the patient is taking
- The dose of the drug(s) that are given
- One's individual sensitivity to the drug(s)
- One's drug treatment in the past

**Trujillo-Martín, M.M., de Armas-Castellano, A., González-Hernández, Y., González-Pacheco, H., Infante-Ventura, D., Del Pino-Sedeño, T., Ramallo-Fariña, Y., Abt-Sack, A., Rueda Domínguez, A. & Serrano-Aguilar, P.** 2023.

**Objective:** Alopecia is one of the most common adverse effects of chemotherapy, having a significant impact on the quality of life of patients who suffer from it. Among the interventions available for its prevention, scalp cooling (SC) is the most widely used. The aim of this study was to assess the efficacy and safety of the use of SC systems during chemotherapy sessions for the prevention or the reduction of the extent of chemotherapy-induced alopecia.

**Methods:** A systematic review of the literature published up to November 2021 was carried out. Randomized clinical trials were selected. The main outcome measure was alopecia (hair loss>50%) during and after chemotherapy treatment. When possible, a quantitative synthesis of the results was performed through meta-analysis using the Stata v.15.0 software. The risk ratio (RR) of the variable alopecia, was estimated using a random effects model following the Mantel-Haenszel method.

Statistical heterogeneity of the results was evaluated graphically and through the test of heterogeneity $\chi^2$ and the Higgins $I^2$ statistic. Sensitivity analyses and subgroup analyses were performed.
**Results:** 13 studies were included, with a total of 832 participants (97.7% women). In most studies, the main chemotherapy treatment applied was anthracyclines or the combination of anthracyclines and taxanes. The results obtained indicate that SC prevents alopecia (loss>50%) by 43% compared to the control group (RR=0.57; 95% CI=0.46 to 0.69; k=9; n=494; $I^2$=63.8%). No statistically significant difference was found between the efficacy of automated and non-automated cooling systems (P=0.967). No serious short- or medium-term adverse events related to SC were recorded.
**Conclusions:** The results suggest that scalp cooling contributes to the prevention of chemotherapy-induced alopecia.
Conflict of interest statement
Los autores declaran que no existe conflicto de intereses.

**Contreras Molina, M., Álvarez Bueno, C., Cavero Redondo, I., Lucerón Lucas-Torres, M.I., Jiménez López, E. & García Maestro, A.** 2023.
**Background:** Chemotherapy-induced alopecia could cause significant psychological changes, affecting patients' quality of life and their capacity to cope with the disease.
**Objectives:** The aims of this study was to analyze the effectiveness of scalp cooling (SC) to prevent chemotherapy-induced alopecia in patients with breast cancer and to compare the use of automated versus nonautomated therapy delivery devices.
**Methods:** We searched the Cochrane Central Register of Controlled Trials, MEDLINE (through PubMed), Scopus, Web of Science, and ClinicalTrials.gov from their inception to October 2022. A meta-analysis was performed to assess the effects of SC to prevent chemotherapy-induced alopecia in patients with breast cancer using fixed-effects models to calculate the pooled relative risk (RR) and corresponding 95% confidence interval (CI).
**Results:** The 8 included studies showed a 43% reduction in the risk of chemotherapy-induced alopecia (RR, 0.57; 95% CI, 0.50-0.64) after the use of SC. Moreover, the use of automated SC devices showed a 47% reduction (RR, 0.53; 95% CI, 0.45-0.60) in the risk of chemotherapy-induced alopecia versus a 43% reduction in the risk of chemotherapy-induced alopecia for nonautomated SC devices (RR, 0.57; 95% CI, 0.44-0.70).
**Conclusion:** Our results showed that SC significantly reduced the risk of chemotherapy-induced alopecia.
**Implications for practice:** Local cold application is a nonpharmacologic therapy that may provide a useful intervention to reduce hair loss and contribute to the psychological well-being of women. Scalp cooling contributes directly to reducing concern about altered body image and to reducing anxiety related to self-concept.
Conflict of interest statement
The authors have no funding or conflicts of interest to disclose.

**Chemotherapy Drugs that Usually Cause Hair Loss**
Of the chemotherapy drugs commonly used to treat cancer, several are known to cause hair loss. It is important to keep in mind, however, that many factors such as the dose, route of administration, combination of drugs, and other individual characteristics will all impact on whether or not hair loss occurs as well as the degree of hair loss experienced.

The chemotherapy drugs most often associated with hair loss are:

- **Adriamycin (doxorubicin)** - often causes hair loss. When administered as an injection every three to four weeks, hair loss is usually total including eyebrows, eyelashes and pubic hair. Weekly injections of lower doses are associated with minimal or no hair loss
- **Carboplatin** - when used alone rarely causes hair loss. When used in combination with Cytoxan (cyclophosphamide), hair loss occurs about half of the time
- **Cisplatin** - may cause hair loss; however, this side effect is uncommon
- **Cytoxan (cyclophosphamide)** - commonly causes hair loss
- **Dactinomycin** - may cause hair loss which is not limited to the scalp
- **Etoposide** - may cause mild hair loss in some patients, although some patients develop total baldness
- **Hexamethamelamine (HMM, altretamine) -** may cause hair loss; however, this side effect is uncommon
- **Ifosfamide** - commonly causes hair loss
- **Taxol** - causes hair loss in almost 100% of patients. Hair loss usually occurs 14 to 21 days after treatment and often affects all body hair including eyebrows, eyelashes, and pubic hair
- **Vincristine** - causes hair loss in less than half of patients.

Other chemotherapy drugs which are less frequently associated with hair loss, either because the frequency of hair loss or degree of hair loss is less, include: bleomycin, 5-fluorouracil (5-FU), and methotrexate.

**Coping with hair loss**

If worried about hair loss or thinning of hair from cancer treatment, the tips below might help. Ask the treating physician or nurse if the cancer drugs prescribed for you will cause hair loss.

If complete hair loss is a possibility:

- Ask about a wig before treatment commences, in order to match the colour and texture with one's real hair
- If feeling adventurous, choose a wig for a whole new look – why not the colour and style you have always wanted!
- Think about having hair cut short before treatment starts
- Some people shave their hair off completely to avoid the distress of seeing the hair fall out
- Wear a hair net at night not to wake up with hair all over the pillow, as this can be upsetting

For hair loss or thinning:

- Use gentle hair products such as baby shampoos
- Do not use perms or hair colours on thinning hair - colours may not take well and perms can damage the hair
- Use a soft baby brush and comb the thinning hair gently
- Try not to brush or comb thinning hair too hard – a soft baby brush may help
- Avoid using hair dryers, curling tongs and curlers on thinning hair
- Pat the hair dry
- If the scalp flakes or itches this means it is dry – use oil or moisturiser, not dandruff shampoo

**The Cool Cap**

A cool cap (also known as a 'hypothermia cap', 'cold cap' or 'cooling cap') is a therapeutic device used to cool the human scalp. The most prominent medical applications of this device are said to be in preventing or reducing alopecia (hair loss) as a result of chemotherapy.

Worn tight on the head, hypothermia caps are typically made of a synthetic such as neoprene, silicone or polyurethane, and filled with a coolant agent such as ice or gel which is either frozen to a very cold temperature (usually -25°C to -30°C) before application or continuously cooled by an auxiliary attached control unit.

[Picture Credit: The Cool Cap]

It is said that a cool cap can prevent hair loss in up to 80% of patients and that it is particularly effective against the drugs used in treating breast cancer.

**Concerns Over the Use of Scalp Cooling**

Some doctors worry about using scalp cooling with treatment that aims to cure the cancer. There are concerns that cancer cells that may have spread to the scalp may be more likely to survive chemotherapy if scalp cooling is used. However, cancer spreading to the scalp is very uncommon.

Clinical trials have shown that the risk of this occurring as a result of scalp cooling is very small, except in haematological cancers. Some people may prefer not to have scalp cooling because of this, but others are happy to try it. If interested in scalp cooling, talk about it with one's treating physician.

Scalp cooling is not effective with all chemotherapy drugs. It is most likely to be effective with:

- Cyclophosphamide
- Daunorubicin
- Docetaxel (Taxotere ®)
- Doxorubicin
- Paclitaxel (Taxol (paclitaxel ®).

**Good Candidates for Scalp Cooling**

Scalp cooling is not suitable for everyone. It is not suitable if the following applies:

- Patients who have a haematological cancer such as myeloma, leukaemia or lymphoma. This is because there is a high risk of cancer cells surviving in the blood vessels of the scalp, causing the cancer to come back after treatment
- Patients who need very high doses of chemotherapy, as this makes scalp cooling less likely to work
- Patients having continuous chemotherapy through a pump for several days, as this makes it impractical to have scalp cooling

- Patients whose liver are not working as well as it should be. This may lead to the chemotherapy drugs circulating in the body for longer than usual, and it may not be possible to keep the scalp cold for long enough
- Patients who have severe migraines
- Patients who have already had a first course of chemotherapy and did not have scalp cooling for it

**How to Use a Cool Cap**

Before embarking or making use of a cool cap, this should be discussed with one's treating physician.

If approved by the treating physician the cap is worn during each chemotherapy session for:

- 20 to 50 minutes before
- during
- after each chemotherapy session (the amount of time the cap is to be worn after the chemotherapy session depends on the type of chemotherapy the patient receives)

If the patient uses a cool cap that needs to be filled with ice or where the cooled gel needs to be replaced may have to change the cap several times during the chemotherapy treatment. Each cap is usually worn for about 30 minutes; then it warms up and is replaced with a new cap. In the case of caps that are chilled by an external control unit, the cap does not have to be changed during treatment.

Because the caps are so cold, some patients get a headache while wearing the cap. Most patients also get very cold, so it makes sense to dress warmly and bring warm blankets with if it is decided to try the cold cap regime.

**Looking After Your Hair Through the Paxman Experience.**

Below is an excellent guide for those interested in utilising scalp cooling.

***Prior to, and During Treatment***

1. Be proactive. If you feel the cap isn't tight enough on your scalp, please notify someone.
2. It is important that the cap is touching the crown of the head.
3. The chin strap may be uncomfortable but this is important for close fitting of the cap. Loosening it may prevent the cap from touching the crown and hair loss could occur. If it is causes any discomfort, ask a healthcare professional to use some gauze as a cushion between the chin and the strap.
4. You should feel scalp cooling evenly throughout the scalp. If you do not, let the healthcare professional know right away.
5. You can use a blanket or neck scarf and drink plenty of warm drinks to help with the coldness.
6. Consult your medical team for pain relief before the treatment if you are concerned you may get a headache.
7. If you have thick braids or hair extensions, please remove before using the scalp cooling system.

***After Treatment***

8. You may see ice on your hair after completion of the treatment.
9. Avoid harsh hair treatments like colouring, extensions, braiding, curling, straightening, etc.

10. Brush hair gently and shampoo hair less often and with a sulphate-free shampoo; style with finger tips.
11. Moderate hair loss (30-50%) is expected while using the cap.
12. If you don't feel you have to wear a wig or a head cover, it's considered a success.
13. You may experience hair re-growth during chemo treatment while having scalp cooling.

***Possible side Effects***

14. Common side effects other patients have experienced during scalp cooling:

- Complaints of coldness/cold related discomfort
- Headaches ranging from mild to severe
- Heavy feeling on the head
- Forehead pain
- Neck pain that comes and goes
- Light-headedness or dizziness (during scalp cooling and/or following removal of the cap at the end of scalp cooling)
- Complaints of uncomfortable sensations.

***Looking After Your Hair Through the PAXMAN Experience***

- Be gentle at all times with your hair!
- Don't be afraid of brushing your hair. It is sensible to use a good quality brush as poor quality ones will snag and tear your hair.
- Avoid perms and colours whilst receiving chemotherapy treatment.
- Avoid using excessive heat on the hair; dry gently and do not use hair straighteners!
- Wash your hair using lukewarm, tepid water and a mild shampoo. The scalp can become sensitive to the perfumes and preservatives in cosmetic shampoos.
- To deal with tangles in the hair it helps to brush out with a wide tooth comb whilst in the shower, with a lot of conditioner in your hair. It also helps to hold the hair above the tangles so that it does not stress the hair roots. Whilst using scalp cooling it is not advised to go to the hairdressers, to ensure your hair is under the least amount of stress possible. However, sometimes you may feel as though you have to go to simply make you feel better in yourself! If you do go please take along this leaflet to ensure they understand about scalp cooling and minimise stress to the hair. On completion of chemotherapy treatment, if your hair and scalp are in good condition with no sensitivity to the scalp and the hair is long enough for styling, you can use chemical hairdressing services on the hair. You may find it useful to read experiences or watch video testimonials of the many people who have used the Paxman system to retain their hair.

**Recent Trials in the Use of Scalp Cooling**

One of the trials used the Orbis Paxman Hair Loss Prevention System (Paxman Coolers Ltd), is approved by the FDA as well as by the EU. The Paxman device is a two-cap system consisting of an inner silicon cap in which refrigerated fluid is circulated and an outer neoprene cap that insulates the scalp. The cap is fitted snugly to the head and is held in place with a chin strap.

[Picture Credit: Courtesy of Paxman]

Treatment was deemed to be a success if clinicians blinded to randomization judged patients to have experienced no hair loss or only grade 1 hair loss (<50% hair loss not requiring a wig), as defined by the Common Terminology Criteria for Adverse Events version 4.0 (CTCAEv4.0) alopecia scale.

At the time of the planned interim analysis, 95 women had been treated with the scalp cooling device and 47 others had received no specific treatment for alopecia.

Results showed that after the fourth cycle of chemotherapy, 50.5% of the cooling group retained their hair, achieving a grade 0 or 1 on the CTCAEv4.0 scale — meaning no wig or scarf was needed — vs 0% of controls.

The second published study used a different scalp cooling device, the *DigniCap*, developed by Dignitana AB). This device was approved for use in the United States in 2015, and initial results from this study were reported at the time by *Medscape Medical News*.

[Picture Credit: Courtesy of Dignicap]

In this study, 106 women with early-stage breast cancer used the DigniCap device, and another 16 women served as controls.

Importantly, almost all women in this study received some form of taxane-based chemotherapy, and no women in the scalp cooling group received an anthracycline-based regimen. The mean duration of chemotherapy in this particular study was 2.3 months.

Scalp cooling was initiated 30 minutes prior to each chemotherapy cycle, with scalp temperature maintained at 3°C (37°F) throughout chemotherapy and for 90 minutes to 120 minutes afterward.

Of 101 evaluable patients assigned to the scalp cooling group, 66.3% experienced hair loss of 50% or less from baseline, meaning they had a score of 0 to 2 at study endpoint. This compared to 0% of women in the control group

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