

# REDUCTION OF CHEMOTHERAPY CONCENTRATIONS IN HAIR FOLLICLES AFTER SCALP COOLING FOR PREVENTION OF CHEMOTHERAPY-INDUCED ALOPECIA

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## Introduction

Scalp cooling (SC) is hypothesized to reduce the severity of chemotherapy-induced alopecia (CIA) via vasoconstriction, limiting the drug uptake to the hair follicle matrix cells. However, no formal studies have been conducted to evaluate whether chemotherapy concentrations in the hair follicles are truly reduced after SC.

## Objectives

This study was designed to compare drug concentrations in the hair follicles with or without SC among breast cancer patients receiving doxorubicin and/or cyclophosphamide.

## Methods

This was a prospective, open-label study. Two groups of patients were recruited (with SC vs. without SC). In the SC arm, patients were provided SC for 30 minutes prior to chemotherapy infusion and continued until 1-hour post treatment. The scalp surface temperature was kept  $\leq 19^{\circ}\text{C}$  to ensure consistent cooling. Hair follicles were taken 5 days after the first cycle of chemotherapy, and samples were analyzed using liquid chromatography-tandem mass spectrometry.

## Results

Hair follicles of 10 patients (7 SC and 3 without SC) were analyzed. Patients receiving SC had lower mean ( $\pm$  SD) concentrations of cyclophosphamide ( $2100 \pm 1059$  vs.  $2816 \pm 2207$  pg/5cm) and doxorubicin ( $1123 \pm 617$  vs.  $3147 \pm 2017$  pg/5cm) in the hair

follicles, comparing to those without receiving SC. Low concentration of cyclophosphamide was also associated with the prevention of CIA among those receiving SC ( $P = 0.045$  for trend).

### **Conclusions**

This is the first study to show that chemotherapy concentrations in hair follicles are reduced among those receiving SC. Hair follicle chemotherapeutic concentrations could be used as a biomarker to indicate the effectiveness of SC devices.