Clinical Performance of the DigniCap System, a Scalp Hypothermia System, in Preventing Chemotherapy Induced Alopecia

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BACKGROUND

- Chemotherapy-induced alopecia is one of the most common and emotionally distressing side effects of cancer therapy [Lemieux 2008, Hesketh 2004, van den Hurk 2010].
- Although scalp cooling has been available for several decades in Europe, use has been limited in the U.S. due to lack of FDA clearance and concerns about the theoretical risk of scalp metastases.
  - A review of all published studies found no evidence of an increase in scalp metastases in those using scalp cooling [Rugo 2013].
  - A review of 1370 women treated in Canada found no impact of scalp cooling on survival from early stage breast cancer [Lemieux 2015].
- Following a successful 20 patient pilot study [Rugo 2013] the clinical performance of scalp cooling using the DigniCap System was evaluated in a multicenter prospective trial for FDA clearance.

OBJECTIVES

- The primary endpoint was efficacy of hair preservation one month after the completion of all chemotherapy, with success defined as patient self-assessed maximum Dean score of ≤ 2 (Table 1).
- Secondary objectives included safety, as determined by patient reported adverse events and by scalp examination. Patients are being followed annually for 5 years to determine the incidence of scalp metastases.

METHODS

Study Design

- Prospective, non-randomized, open label, concurrent age and treatment-matched control, multicenter study.
- Patients who chose not to undergo scalp cooling were enrolled as controls.

Eligibility

- Women, age 18 or older, with stage I-II breast cancer receiving common neo/adjuvant chemotherapy regimens, excluding sequential or concurrent anthracycline/taxanes.

Table 1: Dean scale [Dean 1979]

Dean Grade	Percentage of Hair Loss	Success/Failure
Grade 0	No hair loss	Treatment Success
Grade 1	>0 up to 25% hair loss	
Grade 2	>25% up to 50% hair loss	
Grade 3	>50% up to 75% hair loss	Treatment Failure
Grade 4	>75% hair loss	

RESULTS – CHEMOTHERAPY REGIMENS

122 patients were enrolled; 106* DigniCap & 16 controls.

**5 patients were not evaluable for the primary endpoint: Toxicity from chemotherapy discontinuing early (4); ineligible with stage 3a disease, one month follow-up not completed (1).*

Table 2: Chemotherapy Regimens in Treatment and Control Groups

Chemotherapy Regimen & Dose	DigniCap N(%)	Controls N(%)
Totals	101	16
Docetaxel 75 mg/m² & cyclophosphamide 600 mg/m² every 3 weeks or 4 - 6 cycles	76 (75%)	10 (62.5%)
Paclitaxel 80 mg/m² weekly for 12 cycles	12 (12%)	2 (12.5%)
Docetaxel 75mg/m², carboplatin AUC 6 for 6 cycles every 3 weeks, trastuzumab weekly or every 3 weeks, with or without pertuzumab every 3 weeks	12 (12%)	3 (19%)
Docetaxel 75 mg/m², trastuzumab· pertuzumab every 3 weeks for 6 cycles	1 (1%)	0
Doxorubicin 60 mg/m² & cyclophosphamide 600 mg/m² every 3 weeks for 4 cycles	0	1 (6%)

RESULTS - EFFICACY

Table 3: Efficacy results at 1 month after completion of chemotherapy

	Patients using the DigniCap N = 101		Control N = 16	
Dean Score	N (%)	Success/ Failure % (N)	Control N (%)	Success/ Failure % (N)
0	5 (5.0%)	Success: 66.3%** (67, 95% CI, 56.2-75.4%)	0 (0.0%)	Success: 0.0% (0)
1	31 (30.7%)		0 (0.0%)	
2	31 (30.7%)		0 (0.0%)	
3	19 (18.8%)	Failure: 33.7% (34)	6.3% (1)	Failure: 100.0% (16)
4	15 (14.9%)		93.8% (15)	

**p-value for comparing DigniCap to control P<0.001 from a Fisher's exact test

RESULTS – EFFICACY (Cont.)

Table 4: Success by Chemotherapy Regimen in Treatment and Control Groups

Chemotherapy	DigniCap	Control
	Treatment success[6]	Treatment success[6]
TC[1]	48/76 (63.2%)	0/10
TCarbo[2]	10/12 (83.3%)	0/3
Paclitaxel[3]	12/12 (100%)	0/2
Docetaxel[4]	1/1 (100%)	0/0
AC[5]	0/0	0/1

[1]TC: Docetaxel/cyclophosphamide x 4-6; [2]TCarbo: Docetaxel/carboplatin + HER2 targeted therapy x 4-6; [3]Paclitaxel: Paclitaxel weekly x 12; [4]Docetaxel + HER2 targeted therapy x 4-6 ; [5]AC: Doxorubicin/cyclophosphamide x 4; [6]Treatment success: Dean score ≤ 2

Figure 1a: Scalp cooled patient at baseline and at 1 month following 4 cycles of TC. Dean score 1.

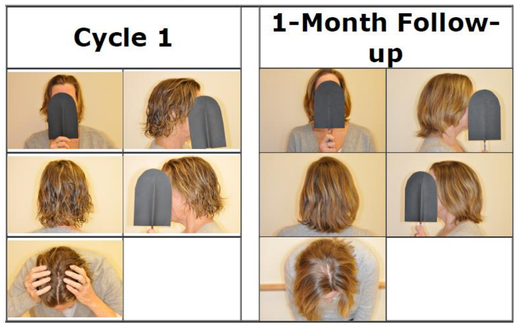
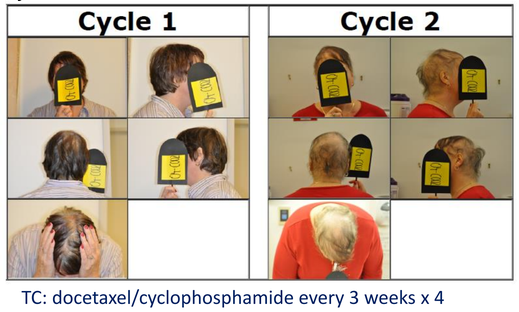


Figure 1b: Control patient at baseline and at second cycle of TC. Dean score 4.



TC: docetaxel/cyclophosphamide every 3 weeks x 4

RESULTS - SAFETY

- Toxicity included grade 1/2 headache.
- Three discontinued cooling, primarily from feeling cold.
- No scalp metastases have been observed, with mean follow up from last chemotherapy administration of 12.9 months (range: 6.7 to 18 months).

CONCLUSIONS

- **The DigniCap System is highly effective in reducing chemotherapy-induced alopecia with clinically meaningful benefit.**
- **The DigniCap System prevented hair loss in 66.3% of patients with breast cancer receiving neo/adjuvant chemotherapy, compared to control where all patients experienced significant hair loss.**
- **Treatment was safe and well tolerated.**
- **The product was cleared for use in the United States by the FDA on 12/8/2015 for female breast cancer patients being treated with chemotherapy.**

ACKNOWLEDGEMENTS

- The patients and investigators who participated in this trial.
- The Lazlo Tauber Family Foundation for their tremendous support of the pilot and registration study (UCSF)
- Anne Moore Breast Cancer Research Fund (Weil Cornell)
- The Friedman Family Foundation (Mount Sinai Beth Israel),
- Data management and statistical support provided by TargetHealth, Inc.

As presented at the ASCO Annual Meeting June 2015

PRO-20190101-01 EN