PERMANENT CHEMOTHERAPY-INDUCED ALOPECIA

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Impact of CIA on patients

Table 1 Mean transformed impact scores (100 ×) and rankings (between brackets) as found with the psychophysical scaling method.

		Patients	Nurses	Physicians
1	Fear for metastases	70 (1)	86 (1)	90 (1)
2	Fatigue	56 (2)	66 (3)	62 (2)
3	Consciousness of one's own vulnerability	54 (3)	46 (7)	48 (5)
4	Hair loss	45 (4)	41 (9)	30 (12)
5	Nausea	41 (5)	50 (6)	52 (4)
6	Vomiting	38 (6)	51 (5)	59 (3)
7	Concentration problems	36 (7)	30 (13)	23 (15)
8	Mood changes	35 (8)	35 (10)	35 (10)
9	Sleeping difficulties	34 (9)	25 (15)	25 (14)
10	Changes in relationship with partner	32 (10)	72 (2)	48 (6)
11	Constipation	28 (11)	21 (17)	17 (17)
12	Changes in relationship with children	27 (12)	58 (4)	45 (7)
13	Changes in relationship with friends	26 (13)	45 (8)	32 (11)
14	Mouth problems	26 (14)	34 (11)	36 (9)
15	Burning eyes	23 (15)	14 (18)	22 (16)
16	Skin problems	19 (16)	23 (16)	15 (18)
17	Nail problems	15 (17)	7 (19)	8 (19)
18	Diarrhoea	13 (18)	32 (12)	29 (13)
19	Difficulties taking care of oneself	11 (19)	28 (14)	36 (8)

patients (3)

(1) Cash T. Clin Dermatol. 2001; 19 (2) : 161-6
(2) McGarvey EL et al. Cancer pract. 2001;9:283-289
(3) Muldersa M et al. European Journal of Oncology Nursing (2008) 12, 97–102♪

Chemotherapy induced alopecia (CIA) in brea st cancer patients

- 40 to 100% of breast cancer patients experience complete a lopecia during chemotherapy.

- A majority of breast cancer patients consider hair loss as the most traumatic aspect of chemotherapy.
- 8% reject chemotherapy because of extreme anxiety related to CIA.
- Patients with higher distress with CIA had worsen body ima ge, more likely to have depression, lower social and role fun ctions, problems with sexuality, and poorer quality of life.

Psycho-Oncology
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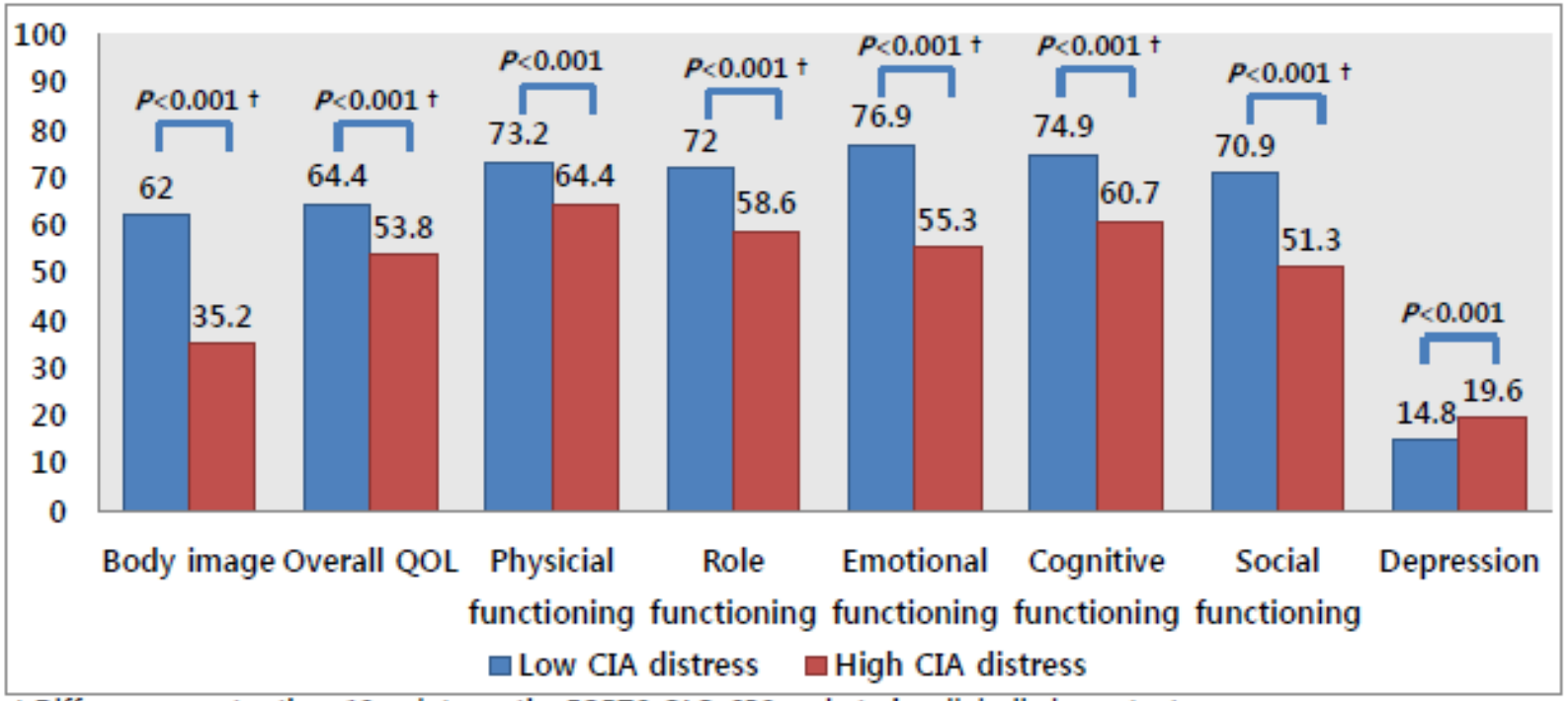
Impact of chemotherapy-induced alopecia distress on body



† Difference greater than 10 points on the EORTC-QLQ-C30 scale to be clinically important
* Positive values indicate improvement

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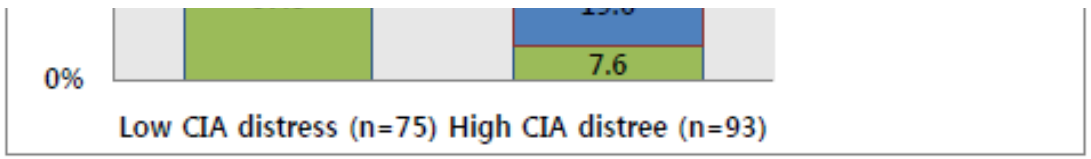
multivariable
and body ima
Results: On



Permanent Chemotherapy Induced Alopecia

- CIA is often considered tempor ary (usually reversible (within t he 3–6 m) but some patients s how absence of or incomplete hair growth even years after co mpletion of chemotherapy

- Permanent alopecia was defin ed as **absent or incomplete hai r regrowth at ≥ 6 months po st chemotherapy**

Table I. Details of studies that report chemotherapy-induced permanent alopecia (CIPAL)

Study, year	No. of patients	Sex (male:female)	Age (y) (median, range)	Disease	Clinical subtypes of CIPAL	Chemotherapy agents
Current study, 2009	7	0:7	41 (22-68)	Breast cancer, germ cell cancers	Diffuse w/or w/o loss of eyebrows	DoCi, DoEp, DoEpCy, BuCy, BuMel
Prevezas et al[3]	2	0:2	56.5 (55-58)	Breast cancer	Diffuse (scalp and body); androgenetic type (50%)	DoLe, Pa
Machado et al[2]	6	2:4	45 (37-65)	Germ cell cancers, Ewing's sarcoma	Complete (50%) w/or w/o facial hair loss; incomplete (33%); patchy (17%)	BuCy, BuCyVP16, CyTBI, CyVP16TBI
Park et al[1]	5	1:4	20 (18-43)	Germ cell cancers, malignant rhabdoid tumor, Ewing's sarcoma	Diffuse	BuCy, CyViAc, Bu, CyViAdVP16
de Jonge et al*, 2002	17	NR	43 (16-59)	Breast cancer, germ cell cancers, ovarian cancer	Complete (47%); incomplete (53%)	CTC
Puglisi et al,[4] 2001	1	Female	53	Breast cancer	Complete	Tamoxifen
Tran et al*, 2000	1	Female	23	Germ cell cancers	Complete (scalp, axilla, pubic region)	BuCy
Ayoub et al†, 1997	1	Female	NR	Breast cancer	Diffuse	Tamoxifen
Gateley et al†, 1997	1	Female	62	Breast cancer	Androgenetic type	Tamoxifen
Liungman et al*, 1995	31	16:15	36 (7-16)	Germ cell cancers, enzyme defect, aplastic anemia	Complete or incomplete (61%), NR (39%)	BuCy
Tornebohm-Roche et al,[5] 1995	1	Female	NR	Essential thrombocytopenia	Complete	Interferon alfa-2a
Vowels et al*, 1993	18	9:9	6.8 (6 mo-20 y, 3 mo)	Germ cell cancers, neuroblastoma, malignant histiocytosis, storage disease, thalassemia	NR	BuCyMel, BuCy, CyTBI
Baker et al*, 1991	6	3:3	26.5 (19-32)	Germ cell cancers	NR	BuCy

Ac, Actinomycin; *Ad*, Adriamycin; *Ci*, cisplatin; *CTC*, cyclophosphamide, thiotepa, carboplatin; *Cy*, cyclosphosphamide; *Do*, docetaxel; *Ep*, epirubicin; *Le*, letrozole; *Mel*, melphalan; *NR*, not reported; *Pa*, paclitaxel; *TBI*, total body irradiation; *Vi*, vincristine; *VP16*, etoposide; *w/*, with; *w/o*, without.
*Data from Machado et al.[2]
†Data from Puglisi et al.[4]

(1) N. Kluger, W. Jacot, E. Frouin, V. Rigau, S. Poujol, O. Dereure, B. Guillot,G. Romieu & D. Bessis. Permanent scalp alopecia related to breast cancer chemotherapy by sequential fluorouracil/epirubicin/cyclophosphamide (FEC) and docetaxel: a prospective study of 20 patients. Annals of Oncology (2012) 23: 2879–2884,
(2) Ioulios Palamaras et al. Permanent chemotherapy-induced alopecia: A review. JAAD. March 2011Volume 64, Issue 3, Pages 604–606.

Permanent scalp alopecia related to breast cancer chemotherapy by sequential fluorouracil/epirubicin/ cyclophosphamide (FEC) and docetaxel: a prospective study of 20 patients

N. Kluger[1,2], W. Jacot[1,3], E. Frouin[1,4], V. Rigau[1,4], S. Poujol[1,5], O. Dereure[1,2], B. Guillot[1,2], G. Romieu[1,3] & D. Bessis[1,2*]

[1]University of Montpellier 1, Montpellier; [2]Department of Dermatology, Saint-Eloi Hospital, Montpellier; [3]Department of Medical Oncology, CRLC Val d'Aurelle, Montpellier; [4]Department of Pathology, Hôpital Gui-de-Chauliac, Montpellier; [5]Oncopharmacology Department, CRLC Val d'Aurelle, Montpellier, France

- A case series of 20 women treated for breast cancer by a sequential F EC and docetaxel regimen who developed severe and permanent alop ecia.♪
- BC patients diagnosed between 1999 to 2009 who were referred by me dical oncologists to the dermatological study from 1 January 2007 to J anuary 2011.♪
- Permanent alopecia was defined as absent or incomplete hair regrowth at 6 months post chemotherapy using Ludwigs classification.♪

Permanent scalp alopecia related to breast cancer chemotherapy by sequential fluorouracil/epirubicin/cyclophosphamide (FEC) and docetaxel: a prospective study of 20 patients- N. Kluger, W. Jacot, E. Frouin, V. Rigau, S. Poujol, O. Dereure, B. Guillot,G. Romieu & D. Bessis - Annals of Oncology (2012) 23: 2879–2884,

- **Hair loss presented with a moderate or intense androgenetic-like pattern of scalp alopecia: 1 patient (5%) a type I degree, 12 women (63%) showed a typ e II), and 6 (32%) a type III degree (intense)**

- **Biopsy specimen examinations (n=15) were normal or displayed the androgenetic lik e pattern.**

Figure 1

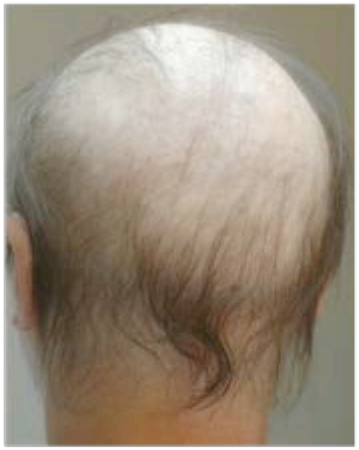


Figure 2

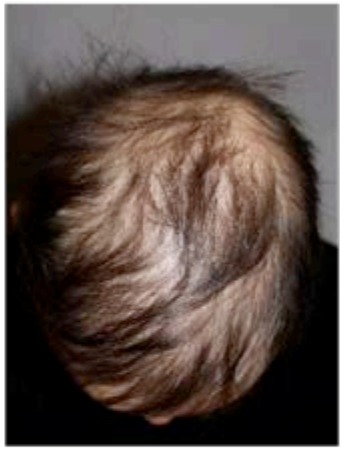


Figure 3

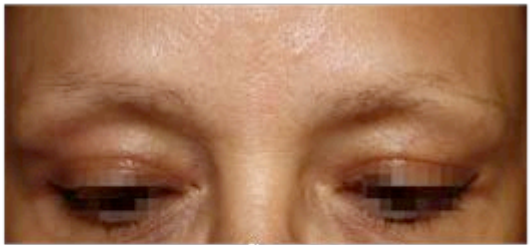


Figure 1 58 year-old. Diffuse and severe alopecia over the parieto-occipital scalp and the vertex, with rare and marked hair thinning (type III degree according to Ludwig's classification).

Figure 2 49 year-old. Diffuse hair loss with marked thin hairs mimicking female androgenetic-pattern hair loss (type II degree according to Ludwig's classification).

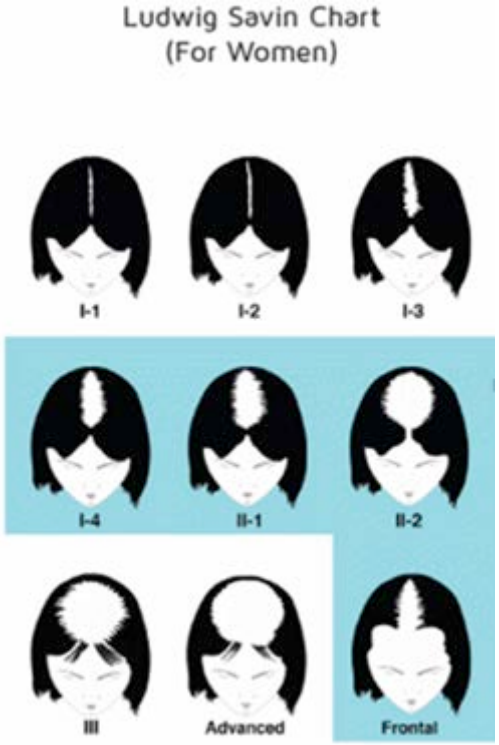
Figure 3 Partial eyebrows alopecia of the patient in Figure 1.

Permanent scalp alopecia related to breast cancer chemotherapy by sequential fluorouracil/epirubicin/cyclophosphamide (FEC) and docetaxel: a prospective study of 20 pati ents- N. Kluger, W. Jacot, E. Frouin, V. Rigau, S. Poujol, O. Dereure, B. Guillot,G. Romieu & D. Bessis - Annals of Oncology (2012) 23: 2879–2884, ♪

PCIA characteristics

- **Physical examination**
  - Hair loss always prominent over the cr own and the frontal scalp, with thinnin g and widening of the central parting o f the scalp

- **Histology**
  - Reduced hair follicle density and/or an increased amount of vellus hair in fav or of androgenetic alopecia were note d in eight cases (53%).



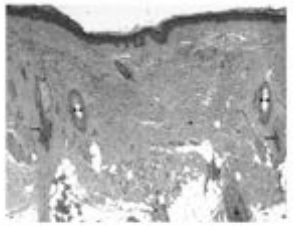
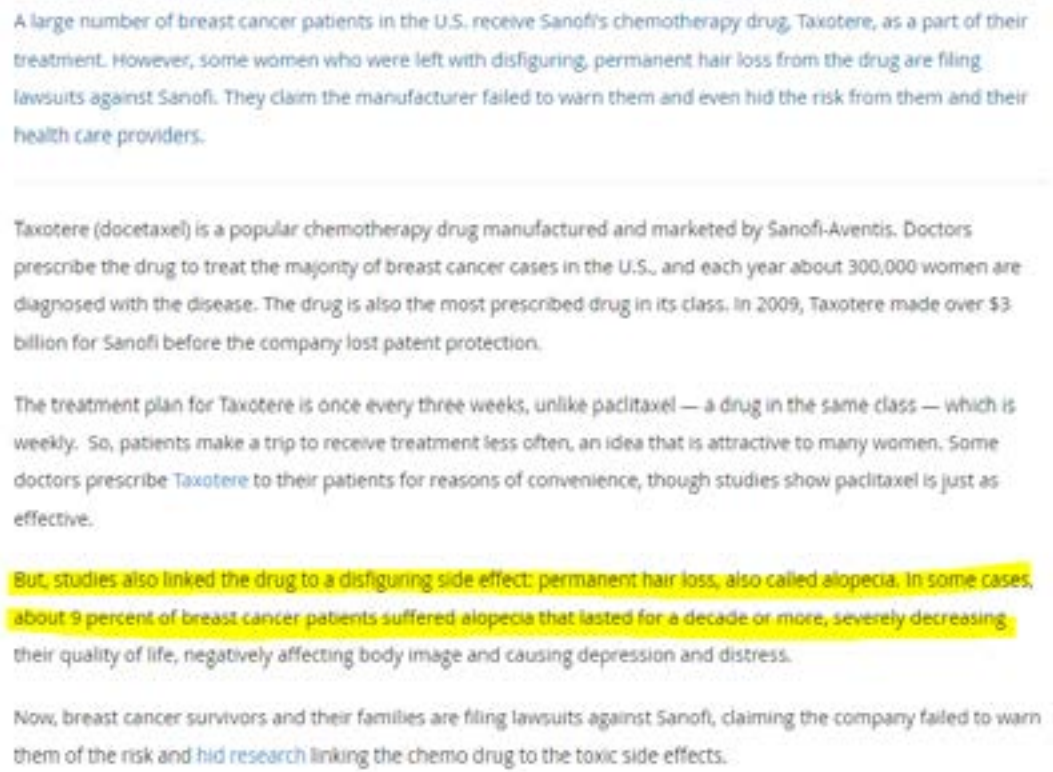


Figure 1. Vertical section of a punch biopsy specimen showing diminished pilosebaceous units (*) with reduced anagen hair follicles (**), two telogen hair follicles (black arrows) and a slight lymphocytic infiltrate of the upper reticulary dermis (white arrows); hematoxylin and eosin, original magnification, ×50.

Permanent scalp alopecia related to breast cancer chemotherapy by sequential fluorouracil/epirubicin/cyclophosphamide (FEC) and docetaxel: a prospective study of 20 pati ents- N. Kluger, W. Jacot, E. Frouin, V. Rigau, S. Poujol, O. Dereure, B. Guillot,G. Romieu & D. Bessis - Annals of Oncology (2012) 23: 2879–2884, ♪

Women Who Say Its Chemotherapy Left The m Permanently Bald



A large number of breast cancer patients in the U.S. receive Sanofi's chemotherapy drug, Taxotere, as a part of their treatment. However, some women who were left with disfiguring, permanent hair loss from the drug are filing lawsuits against Sanofi. They claim the manufacturer failed to warn them and even hid the risk from them and their health care providers.

Taxotere (docetaxel) is a popular chemotherapy drug manufactured and marketed by Sanofi-Aventis. Doctors prescribe the drug to treat the majority of breast cancer cases in the U.S., and each year about 300,000 women are diagnosed with the disease. The drug is also the most prescribed drug in its class. In 2009, Taxotere made over $3 billion for Sanofi before the company lost patent protection.

The treatment plan for Taxotere is once every three weeks, unlike paclitaxel — a drug in the same class — which is weekly. So, patients make a trip to receive treatment less often, an idea that is attractive to many women. Some doctors prescribe Taxotere to their patients for reasons of convenience, though studies show paclitaxel is just as effective.

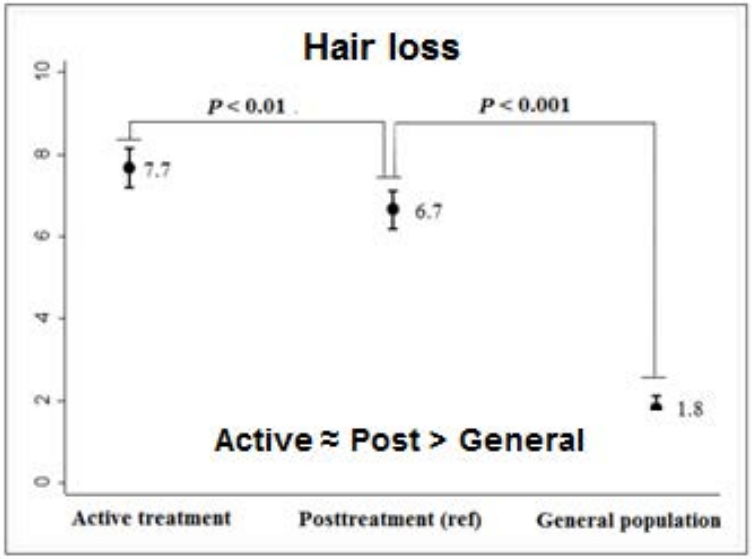
But, studies also linked the drug to a disfiguring side effect: permanent hair loss, also called alopecia. In some cases, about 9 percent of breast cancer patients suffered alopecia that lasted for a decade or more, severely decreasing their quality of life, negatively affecting body image and causing depression and distress.

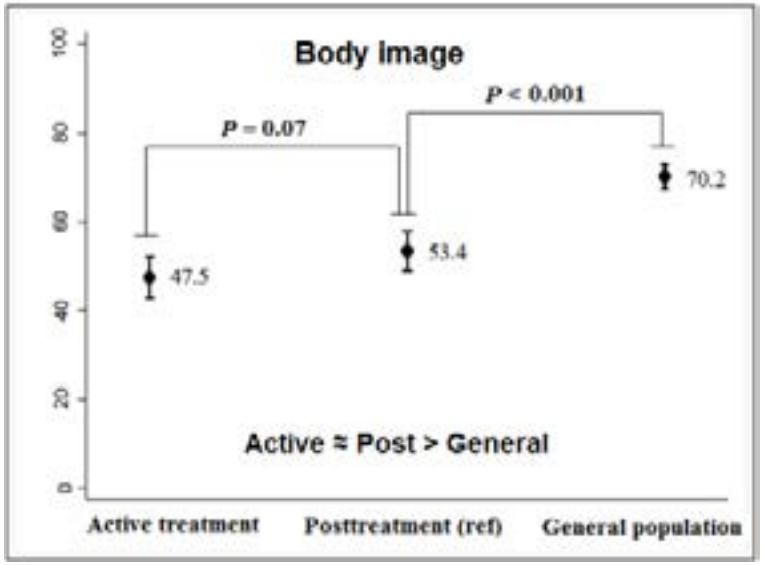
Now, breast cancer survivors and their families are filing lawsuits against Sanofi, claiming the company failed to warn them of the risk and hid research linking the chemo drug to the toxic side effects.

December 2015 – The FDA approves changes to the Taxotere warning label to include information about the alleged **risk of permanent hair loss from the chemotherapy drug**.

PCIA among breast cancer patients

- 40% and 7% of breast cancer patients who had completed chemotherapy more than 6 months before reported still had mild and severe alopecia (1)
- Long-term survivors experienced similar levels of hair loss and poor body image than patients undergoing active chemotherapy (2)





(1) Kim et al, 2017 Chemotherapy-induced irreversible alopecia in early breast cancer patients
(2) Kang d et al., 2017

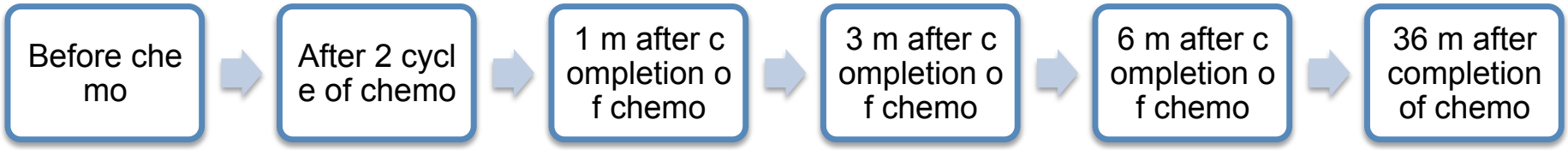
Limitations of the previous studies

- Most studies are limited by:
  - Case-series or cross-sectional designs
  - Exclusive use of patient-reported outcomes only
  - Evaluation of single agents
  - Lack of information on hair condition before chemother apy
  - Short-term follow-up.

DERMA cohort

- **Aim**
  - To estimate the incidence of PCIA in a cohort of breast cancer patients with measurements of hair volume and density prior to chemotherapy and followed for 3 years after chemotherapy.

- **Study design**
  - A prospective cohort study at university cancer hospital Seoul, Korea



Kang d et al., Permanent chemotherapy-induced alopecia in breast cancer patients: A 3-year prospective cohort study, The Oncologist in press

- **Study participants**
  - Stage is I, II, or III Breast cancer patients who expected to rec eive chemo
  - Exclusion: Had history of chemotherapies or dermatologic tre atment

Regimen	Dose	Interval	Cycle	DERMA study
FAC		21 day	6	16
Cyclophosphamide	500 mg/m^2,day 1			
Adriamycin	50 mg/m^2, day 1			
5- Fluorouracil	500 mg/m^2, day 1			
AC		21 day	4	14
Adriamycin	60 mg/m^2, day 1			
Cyclophosphamide	600 mg/m^2,day 1			
AC 4 → T 4		21 day	8	29
Adriamycin	60 mg/m^2, day 1 (1st-4th cycle)			
Cyclophosphamide	600 mg/m^2,day 1 (1st-4th cycle)			
Docetaxel	75 mg/m^2, day 1 (5th-8th cycle)			
TAC		21 day	6	1
Docetaxel	75 mg/m^2, day 1			
Adriamycin	50 mg/m^2, day 1			
Cyclophosphamide	500 mg/m^2,day 1			
TC		21 day	4	1
Docetaxel	75 mg/m^2, day 1			
Cyclophophamide	600 mg/m^2,day 1			

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Outcomes

- **Outcome**
  - **Permanent CIA:** an absence or an incomplete hair regrowth persisting 6 months after chemotherapy completion *Kluger et al, 2015*
    - **Incomplete hair regrowth (PCIA) – if hair density or thickness at 6 month after post-chemotherapy were 2 standard deviations (SDs) or more below the baseline mean (before chemotherapy).**
  - **Hair density and thickness:** Folliscope 4.0, LeadM from vertex area region

  - **Body image:** EORTC QLQ-BR23 (0-100)
  - **Patient reported hair problems at 3 years post chemotherapy**

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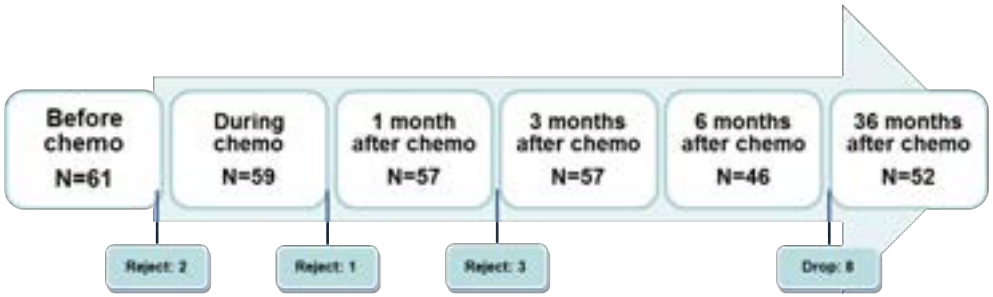
Characteristics of study participants at pre-chemotherapy

- All participants completed the baseline measurements, and 97% (T2), 93% (T3), 93% (T4), 75% (T5), and 83% (T6) of patients completed clinic visits.



- The participants' mean age was 47·1, and 34·4% were diagnosed at stage 3.

- 52.5% patients received the taxane-based regimens

	Overall (N = 61)
Age (years)	47.1 (9.5)
Breast surgery type (mastectomy)	25 (41.0)
Disease stage at diagnosis	
Stage I	19 (31.2)
Stage II	21 (34.4)
Stage III	21 (34.4)
Number of cycles	
4 cycles (AC or TC)	16 (26.2)
6 cycles (FAC or TAC)	16 (26.2)
8 cycles (AC+T)	29 (47.5)
Taxane based chemotherapy	32 (52.5)
Hormone therapy (yes)	43 (70.5)
Targeted therapy (trastuzumab)	32 (52.5)
Menopause (yes)	22 (36.1)
Co-morbidities* (yes)	11 (18.0)

Values are means (standard deviation) or number (%).
AC, doxorubicin, cyclophosphamide; FAC, fluorouracil, doxorubicin, cyclophosphamide; T, taxotere; TAC, taxotere, adriamycin and cyclophosphamide; TC, taxotere and cyclophosphamide.
* Having hypertension, hyperlipidemia, or diabetes.

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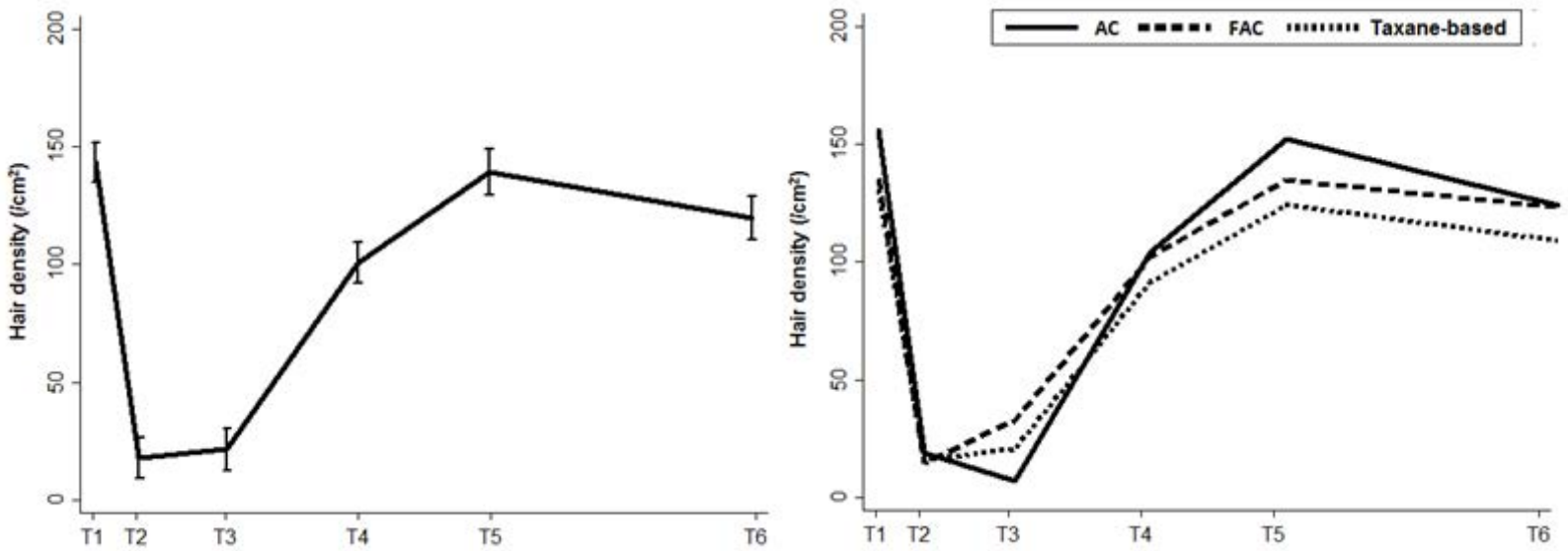
Hair density



Hair density (hairs/cm²)	T1	T2	T3	T4	T5	T6
Overall	138.7 (34.2)	12.1 (17.6)	15.9 (21.3)	96.1 (52.2)	134.2 (42.4)	115.4 (28.9)
AC	157.3 (38.1)	14.9 (30.1)	2.6 (7.4)	103.1 (40.4)	153.4 (42.8)	123.8 (23.4)
FAC	135.9 (29.6)	10.3 (12.7)	29.1 (22.7)	101.5 (39.9)	135.1 (36.5)	123.3 (34.6)
Taxane-based	131.1 (31.7)	11.6 (11.4)	16.5 (21.8)	90.2 (62.3)	124.2 (43.0)	108.4 (27.5)
P value	0.04	0.78	0.004	0.70	0.18	0.17

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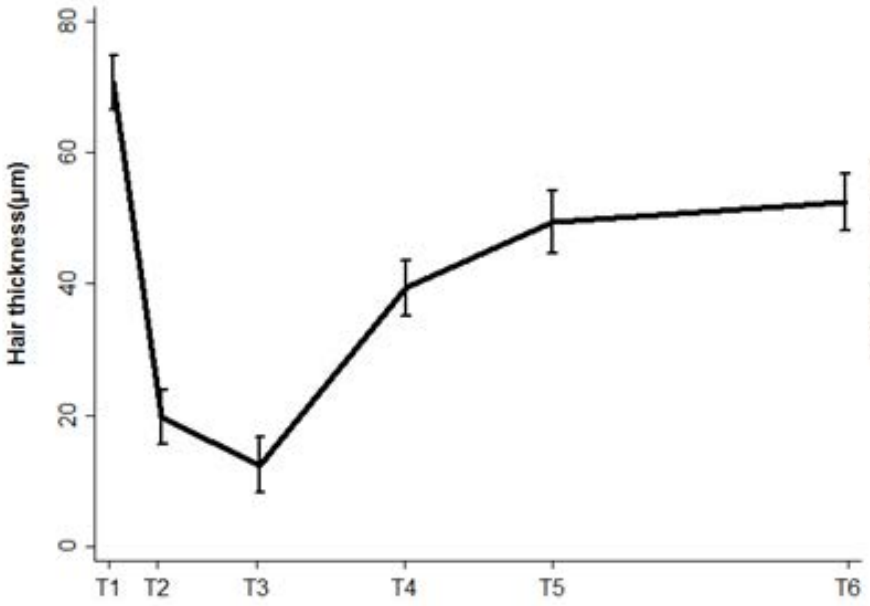
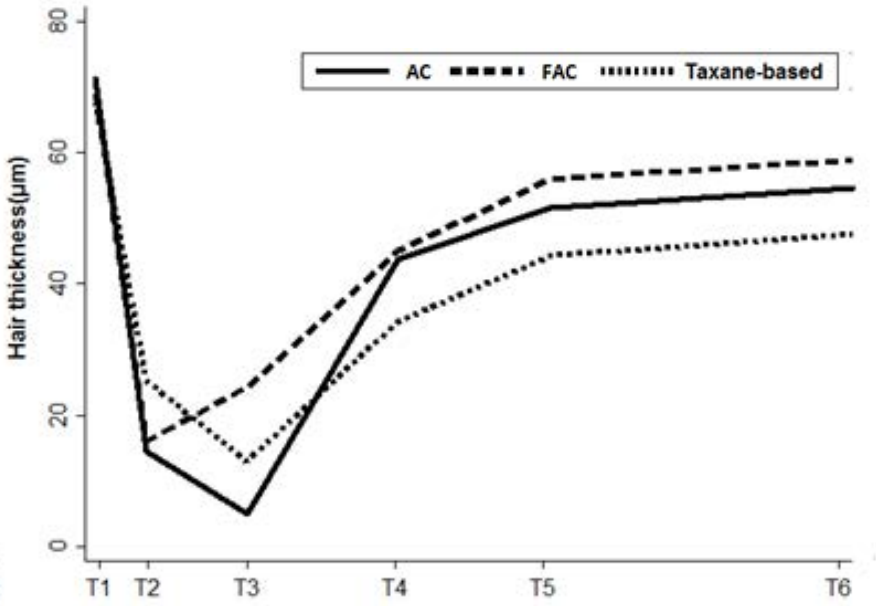
Hair thickness





Hair thickness (μm)	T1	T2	T3	T4	T5	T6
Overall	71.1 (12.4)	19.7 (24.0)	12.4 (15.3)	39.5 (18.5)	49.7 (12.2)	52.7 (11.4)
AC	73.5 (11.9)	13.3 (21.0)	3.3 (10.0)	44.3 (13.0)	52.6 (11.5)	55.7 (9.8)
FAC	71.2 (12.0)	14.9 (19.4)	23.6 (15.7)	45.6 (15.4)	57.2 (13.6)	60.2 (11.3)
Taxane-based	69.9 (13.0)	24.8 (26.5)	11.7 (14.4)	34.3 (20.8)	44.8 (10.1)	48.3 (10.2)
P value	0.66	0.23	0.001	0.10	0.015	0.004

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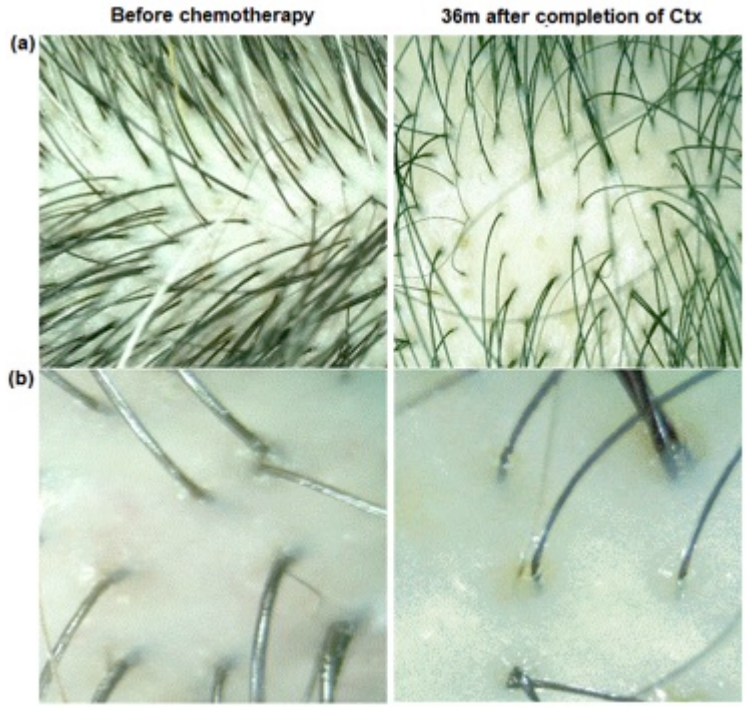
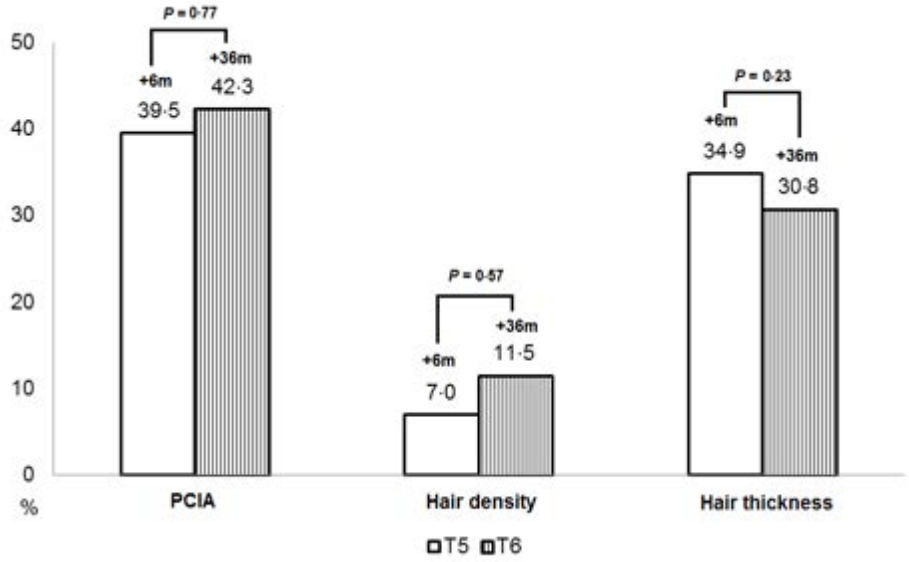
Incidence of permanent chemotherapy-induced alopecia

- Proportion of participants who had PCIA was 39·5% .
- However, 42·3% of patient still had PCIA, especially 30·8% of the patients had incompletely recovered hair thinning.





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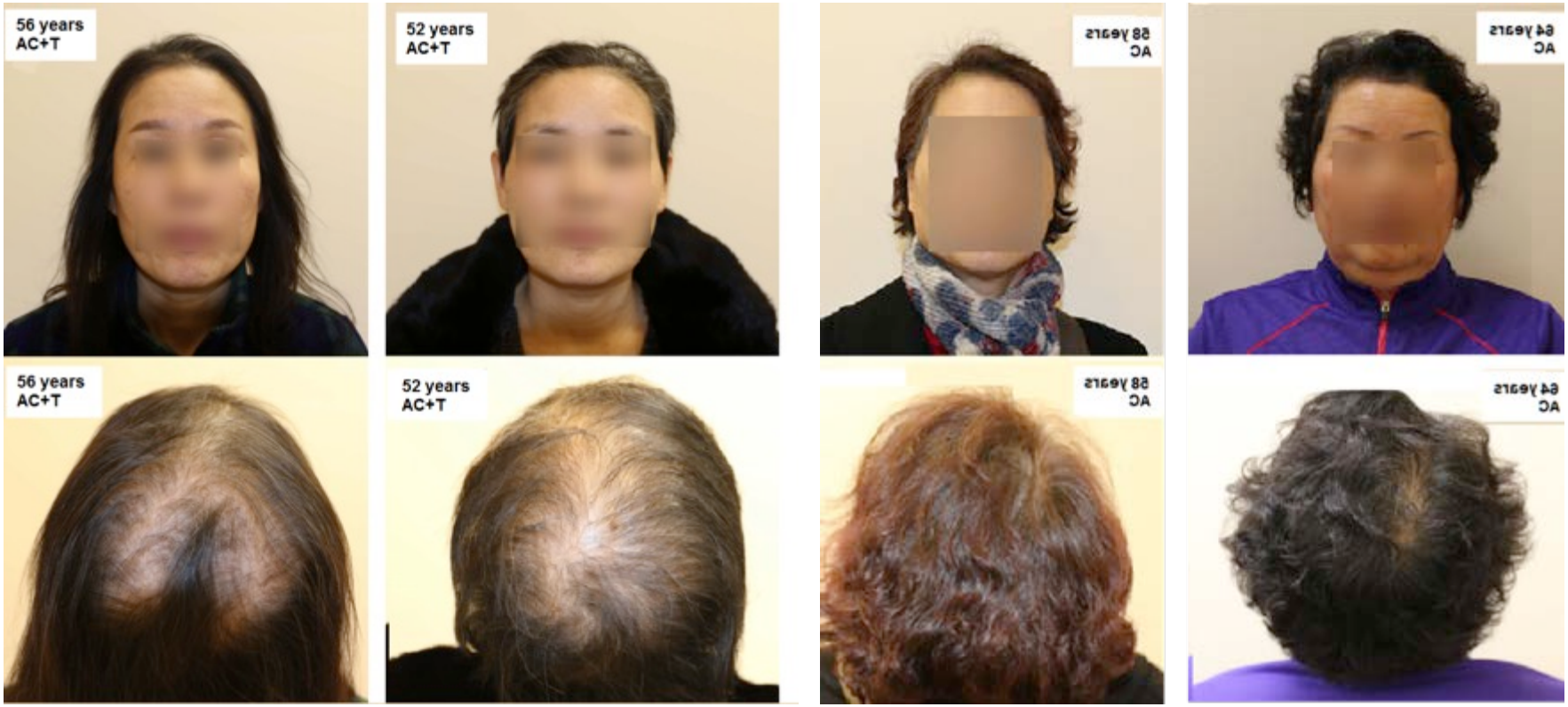
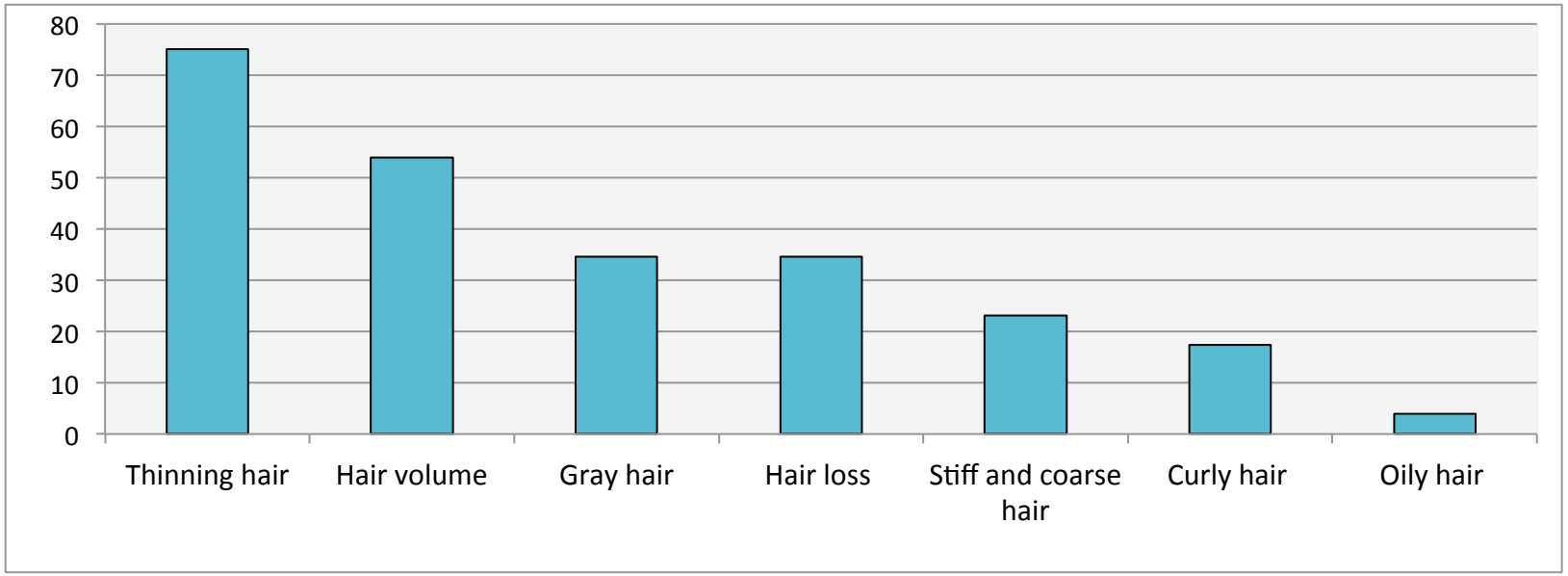
Permanent chemotherapy-induced alopecia



Patient-reported outcomes

- Thinning hair was the most common problem (75·0%), followed by hair volume (53·9%), hair loss (34·6%), and gray hair (34·6%).



Anti-cancer treatment associated with PCIA

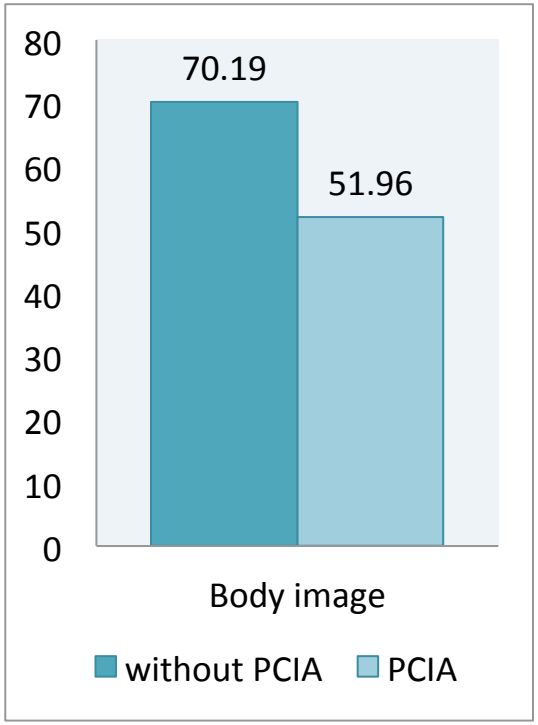
- In multivariable analysis, patients who had a taxane based treatment experienced higher incidence of PCIA

	6 months after completion of chemotherapy	3 years after completion of chemotherapy
	OR (95% CI)	**OR (95% CI)**
Taxane		
No	*Reference*	*Reference*
Yes	6.82 (0.91, 51.06)	8.01 (1.20, 53.26) †
Hormone therapy		
No	*Reference*	*Reference*
Yes	8.52 (0.60, 122.08)	3.81 (0.35, 42.12)
Targeted therapy		
No	*Reference*	*Reference*
Yes	0.09 (0.00, 2.01)	0.16 (0.01, 2.33)

Adjusted for age, hair density and thickness at diagnosis, ♪
† Statistically significant ($P < 0.05$)♪

Impact of PCIA on body image

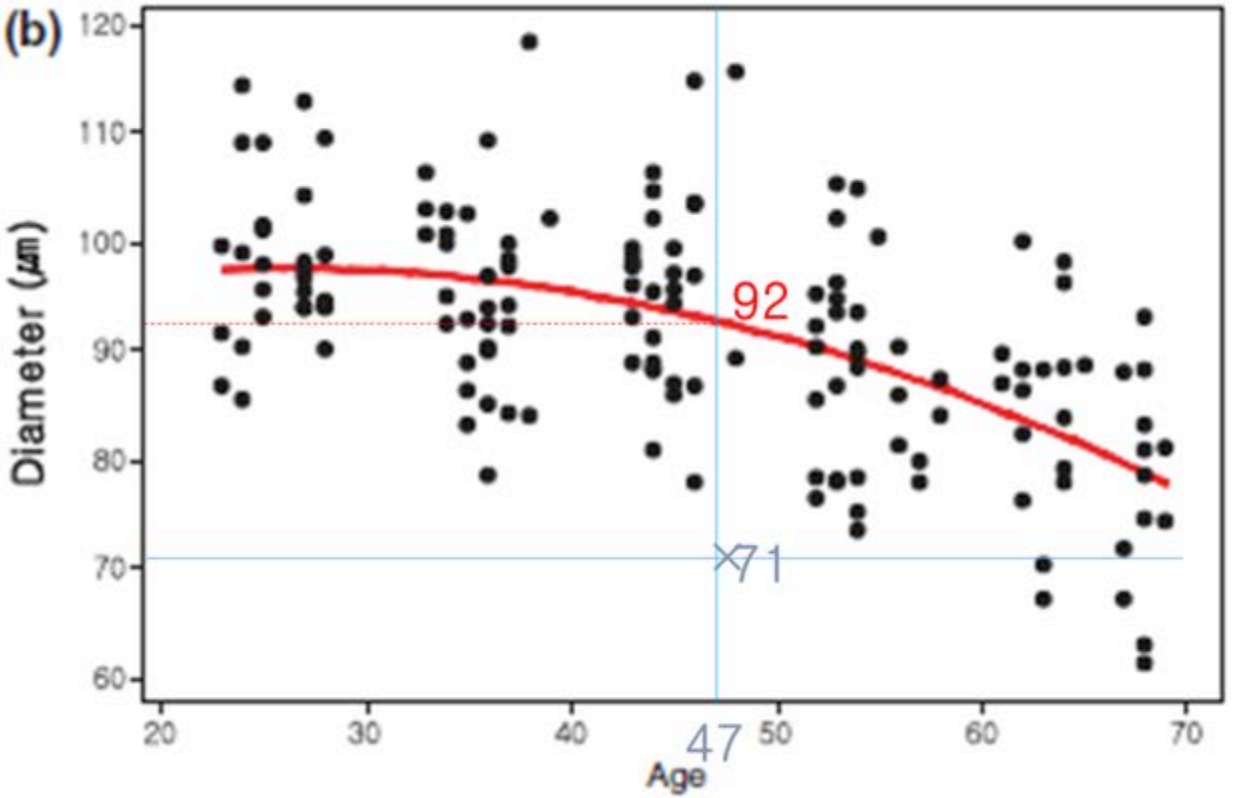
- Patient who had PCIA had lower body image compared to patient without PCIA (51·96 vs. 70·19, P = 0·014)



	Mean body image score (SDs)	Adjusted coefficient (95% CI)
No PCIA	70.19 (21.24)	Reference
PCIA	51.96 (25.09)	**-17.96 (-32.98, -2.94)**
P values	0.014	0.020

Aging effects?

- Average (SD) hair s
  71.1 (12.4) μm and
  after chemotherapy
  reduction in hair t
- In a general popula
  (SD) hair thickness
  decades of live wer
  μm, respectively.



- It might be difficult to compare the results of this study with those of our study due to differences in setting, design, and methods, **chemotherapy-induced partial alopecia seems to far exceed aging-related hair thinning.**

Limitations

- A single institution, had a small sample size, and the findings may not be generalizable to patients in other settings.

- Hair parameters were measured only on the vertex area.

- However, the vertex area is appropriate to assess alopecia in conditions with androgenic-pattern alopecia, such as breast cancer.

- Study participants may have self-selected to participate because they were interested in CIA or had prior hair problems compared to patients who did not participate.

- Patients were recruited prior to chemotherapy and skin changes measured objectively in addition to patient-reported outcomes.

Conclusions

- Over 40% of patients had PCIA 3 years after completion of chemotherapy, primarily due to partial alopecia.
- Patients who had received taxane-based treatment regimes and additional hormone therapy were more likely to experience PCIA.
- Moreover, patients with PCIA had significantly worse body image compared to patients without PCIA.

- **PCIA is a very common problem in breast cancer patients, with important psychological consequences.**
- **Clinicians should be aware of this distressing adverse event and develop supportive care strategies to prepare patients and minimize its impact on well-being.**
- **Development of more satisfactory management strategies for PCIA remains a major research challenge in clinical oncology**

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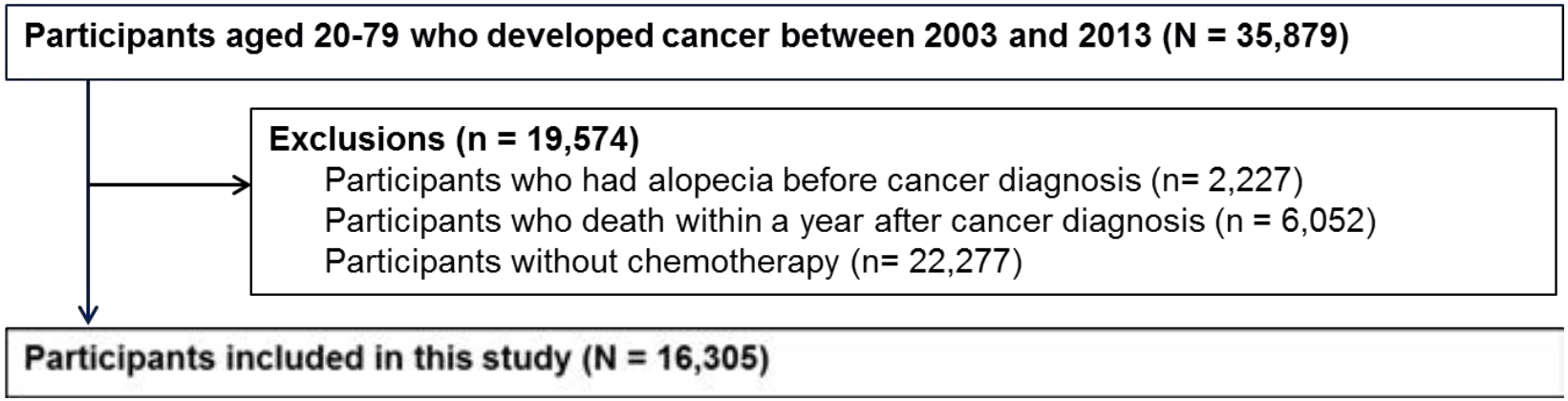
Incidence of PCIA in cancer patients using natio nal claim data

- **Retrospective cohort study using the National Health Insurance Service-National Sample Cohort**
- **Study population**



- **Definition of PCIA**
  - PCIA was defined as patient with alopecia or any medication code after a year or more after cancer diagnosis

Incidence of PCIA in cancer patients using natio nal claim data

- **There were 719 (4.4%) patients developed PCIA after cancer diagnosis**

	No PCIA	PCIA	P-value
Sex			<0.001
Male (n = 7,537)	6,839 (90.74)	698 (9.26)	
Female (n = 8,768)	8,747 (99.76)	21 (0.24)	
Age (years)			<0.001
20-29 (n = 321)	317 (98.75)	4 (1.25)	
30-39 (n = 1,253)	1,246 (99.44)	7 (0.56)	
40-49 (n = 3,190)	5,562 (20.7)	38 (1.19)	
50-59 (n = 4,375)	4,238 (96.87)	137 (3.13)	
60-69 (n = 4,329)	4,027 (93.02)	302 (6.98)	
≥70 (n= 2,837)	2,606 (91.86)	231 (8.14)	

	No PCIA	PCIA	P-value
Type of cancer			<0.001
Thyroid (n = 1,899)	1,876 (98.79)	23 (1.21)	
Stomach (n = 2,082)	1,955 (93.90)	127 (6.10)	
Colon and rectum (n =2,621)	2,470 (94.24)	151 (5.76)	
Lung (n = 1,258)	1,185 (94.20)	73 (5.80)	
Breast (n = 2,254)	2,246 (99.65)	8 (0.35)	
Liver (n = 1,135)	1,088 (95.86)	47 (4.14)	
Prostate (n = 495)	430 (86.87)	65 (13.13)	
Pancreas (n = 226)	220 (97.35)	6 (2.65)	
Hematology (n= 661)	637 (96.37)	24 (3.63)	
Uteri (n= 690)	688 (99.71)	2 (0.29)	
Brain and CNS (n= 201)	197 (98.01)	4 (1.99)	
Lip, oral cavity and pharynx (n= 431)	411 (95.36)	20 (4.64)	
Other and unspecified (n= 741)	713 (96.22)	28 (3.78)	
Oesophagus (n= 175)	169 (96.57)	6 (3.43)	
Larynx (n= 129)	111 (86.05)	18 (13.95)	
Testis (n= 31)	29 (93.55)	2 (6.45)	
Gallbladder (n= 272)	259 (95.22)	13 (4.78)	
Kidney (n= 228)	201 (88.16)	27 (11.84)	
Ovary (n= 311)	311 (100.00)	0	
Bladder (n= 465)	390 (83.87)	75 (16.13)	

Current options against CIA

Method	Proposed mechanism of action	How applied
Scalp hypothermia	Reduction of blood flow to hair follicle when chemotherapy serum levels highest; reduction of biochemical activity	Cooling cap or continuous exposure of scalp to cold air/liquid
Scalp tourniquets	Reduction of blood flow to hair follicle when chemotherapy serum levels highest	Sphygmomanometer cuff is inflated to restrict blood flow to the scalp
AS101*	Protection thought to be derived from up-regulation of macrophage-derived factors, such as IL-1 or possibly prostagl and in E2 secretion	Intravenous injections before and during chemotherapy
Minoxidil	Hair growth cycle modulator; induces telogen hairs to enter anagen, prolongs anagen growth phase	2% topical application applied to scalp during chemotherapy
Vitamin D3	Thought to be related to vitamin D3's general ability to stimulate differentiation of hair follicles and diminish DNA proliferation	Intraperitoneal treatments as pretreatment before chemotherapy or topical application during chemo

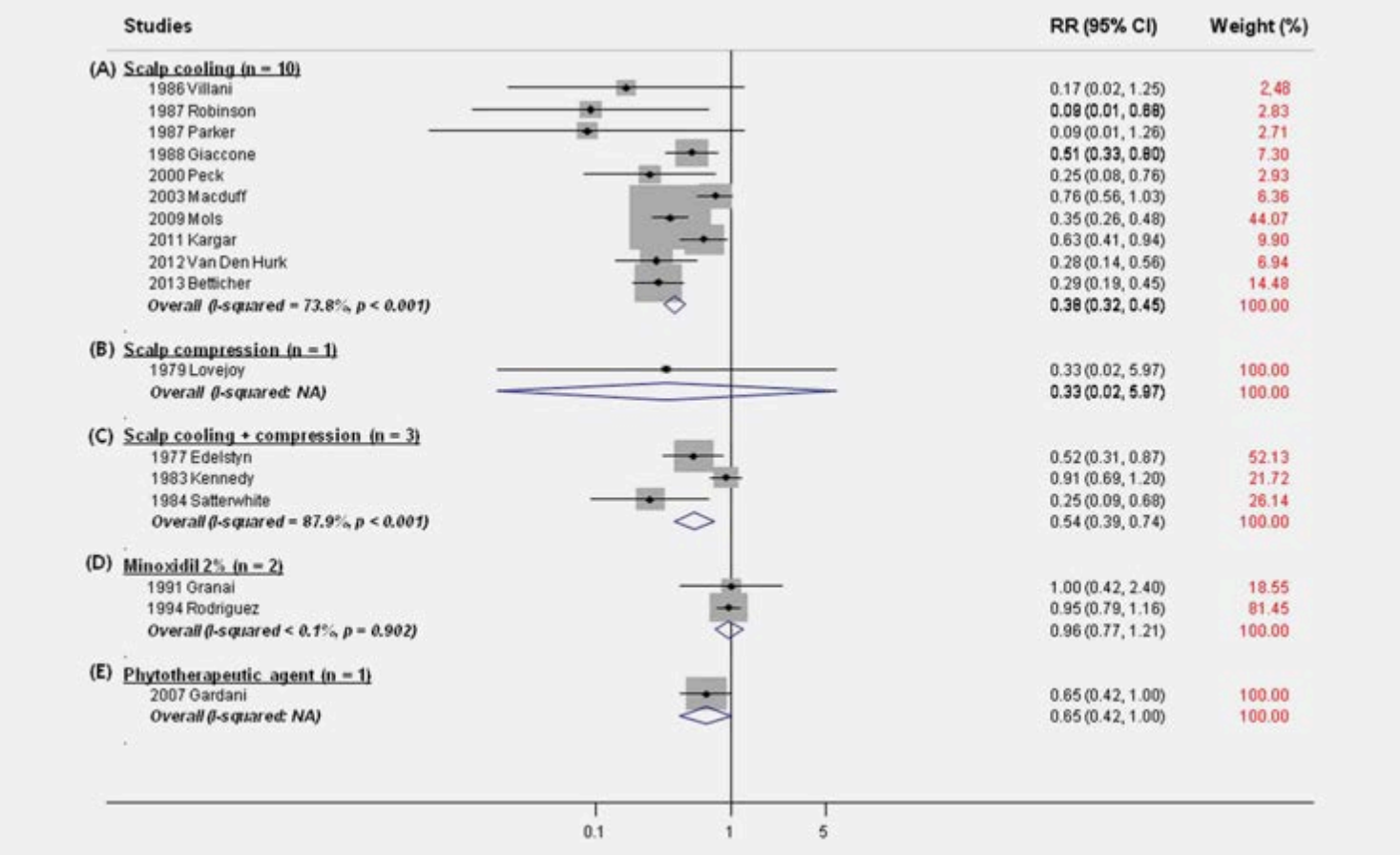
Caroline E. Yeager. Treatment ofchemotherapy-induced alopecia. Dermatologic Therapy. Vol. 24. 2011., 432-442
* ammonium trichloro(dioxoethylene-O, O'-) tellurate♪
♪

Current options against CIA

- **Scalp cooling devices & caps**
  - Variable efficacy and tolerance
  - Costly to operate (Capex, staff)
  - Cost of 2’000 USD (caps)
  - Major concern = head/brain metastasis would be untreated since caps prevent chemo agent to reach the cells (few hospitals are willing to include caps)♪

Clinical Practice Guidelines on the Use of Integrative Therapies as Supportive Care in Patients Treated for Breast Cancer,Society for Integrative Oncology Guidelines Working Group, J Natl Cancer Inst Monogr 2014;50:346–358 (2) Safety and effectiveness of scalp cooling in cancer patients undergoing cytotoxic treatment, Van den Hurk et al., Psych Oncol. 2010; 19: 701-709♪

Current options against CIA



Efficacy of interventions for prevention of chemotherapy-induced alopecia: A systematic review and meta-analysis. Hyoseung Shin, Seong Jin Jo, Do Hun Kim, Ohsang Kwon and Seung-Kwon Myung. Int. J. Cancer: 136, E442–E454 (2015)♪

Current options against CIA

EDITORIAL

Scalp Cooling to Prevent Chemotherapy-Induced Alopecia
The Time Has Come

Dawn L. Hershman, MD, MS

Adjuvant chemotherapy reduces the 10-year relative risk of death from breast cancer by approximately 35%.[1] Efforts have been made to define the subset of women who derive the most benefit from this treatment so patients who are cured without chemotherapy can avoid the toxic adverse effects, and patients who would benefit most from chemotherapy would receive it.[2] Despite these efforts, a substantial number of women are still advised to undergo chemotherapy but choose not to receive treatment because of concerns about adverse effects.[3,4] Therefore, an intervention that could reduce the adverse effects of chemotherapy may lead to improvements in the initiation and completion of therapy, in quality of life, and in survival outcomes. Substantial improvements in supportive care have led to significant improvements in the management of several chemotherapy-induced toxic effects such as nausea and vomiting, fever related to neutropenia, anemia, menopausal symptoms, and infertility.[5] Reassuring patients that symp-

Related articles pages 596 and 606

wrap in only 63% of patients as opposed to 100% of patients requiring wigs or head wraps in the usual care group.

In another article in this issue of *JAMA*, a multicenter prospective cohort study of 106 women receiving taxane-based chemotherapy, Rugo and colleagues[8] reported that among 101 patients treated with the scalp cooling device, 5 (5.0%) had no hair loss and 62 (61.4%) had less than 50% hair loss, compared with 0 of 16 patients in the control group who had less than 50% hair loss. Adverse effects were minimal and limited to headache, skin pain, nausea, and chills.[8] Despite differences in study design, inclusion criteria, and type of device, the results of these 2 studies are reassuringly similar: scalp cooling was associated with prevention of significant hair loss in approximately 50% of women.

At face value, these findings appear to represent a major step forward in improving the quality of life of individuals with cancer. However, in the clinical trial by Nangia et al, there were no significant differences between the scalp cooling group and the control group in the patient-reported outcome of changes


Effect of a Scalp Cooling Device on Alopecia in Women Undergoing Chemotherapy for Breast Cancer
The SCALP Randomized Clinical Trial

Association Between Use of a Scalp Cooling Device and Alopecia After Chemotherapy for Breast Cancer

Dawn L. Hershman. Scalp Cooling to Prevent Chemotherapy-Induced Alopecia The Time Has Come. JAMA. February 14, 2017 Volume 317, Number 6.

Current options against CIA

- **Topical Treatments**
  - Minoxidil therapy requir es daily application, as di scontinuation can lead t o loss of benefits obtaine d♪

Australasian Journal of Dermatology (2016) 57, e130–e132 doi: 10.1111/ajd.12550

BRIEF REPORTS

Treatment of permanent chemotherapy-induced alopecia with low dose oral minoxidil

Xinyi Yang[1] and Keng-Ee Thai[2]

[1]*Faculty of Medicine, University of New South Wales, Sydney* and [2]*Brien Walder Department of Dermatology, Prince of Wales Hospital, Randwick, New South Wales, Australia*

ABSTRACT

Chemotherapy-induced alopecia is a well-established cause of major distress to patients. Permanent chemotherapy-induced alopecia (PCIA) is the absence of or incomplete hair regrowth lasting longer than 6 months after the cessation of chemotherapy and it does not respond to standard treatments of scalp cooling or topical minoxidil. The increasing numbers of reports of PCIA highlight the need for research into an effective treatment. We report a case of a 39 year-old woman with cosmetically significant regrowth after continuous therapy with oral minoxidil.

Key words: alopecia, chemotherapy-induced alopecia, minoxidil, permanent alopecia, systemic therapy.

are yet to be confirmed.[4] Common findings in PCIA show increased vellus hair counts and the presence of thin epithelial structures thought to be the remnants of secondary hair germ of late-stage telogen follicles. These latter structures may be inadequate in forming new anagen follicles for hair regrowth.[1] We present a case of PCIA with a successful response to oral minoxidil.

CASE REPORT

Our patient is a 39 year-old Caucasian woman who had acute myeloid leukemia. She was treated successfully with a course of cyclophosphamide and busulfan chemotherapy followed by a matched, unrelated donor bone-marrow transplant. PCIA was clinically diagnosed based on no cosmetically meaningful hair regrowth 16 months post-transplant. There was no prior history of alopecia nor sclerodermoid graft-versus-host disease post-transplant. On examination there was scant, incomplete coverage of short scalp hairs, with wide expanses of bare scalp between some strands: a 'trees left standing' appearance. She claimed no further lengthening beyond that shown in Figure 1.

Xinyi Yang and Keng-Ee Thai. Treatment of permanent chemotherapy-induced alopeciawith low dose oral minoxidil. Australasian Journal of Dermatology (2016) 57, e130– e132 ♪

Current options against CIA

No	Status	Study	Intervention
1	**Active, not recruiting**	Efficacy and Safety of Dignicap System for Preventing Chemotherapy Induced Alopecia	Device: Dignicap System
3	**Completed**	START: Swiss Taxotere Alopecia Prevention Trial	Device: Cold Caps
4	**Recruiting**	Efficacy, Safety and Tolerability of CG428 Cutaneous Solution on Chemotherapy Induced Alopecia; Controlled Study (ELAN)	Drug: CG 428
5	**Completed**	EValuation of the Impact of a TOpical Lotion on Permanent Chemotherapy Induced Hair Disorders in Cancer Survivors	Drug: CG 428
6	**Active, not recruiting**	Scalp Cooling to Prevent Chemo-induced Hair Loss	Device: Cold Caps
9	**Completed**	A 6-month Post-interventional Follow-up Extension of VOLUME Study (VOLUME-2)	Drug: CG 428
10	**Recruiting**	Efficacy of the Use of Refrigerant Helmet to Prevent Alopecia in Patients Treated With Eribulin for Breast Cancer	Device: Cold Caps