What Types of Hot Flashes are Associated with Sleep Disturbances in Breast Cancer Patients?

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INTRODUCTION

- Insomnia symptoms are reported by 42 to 70% of breast cancer patients.
- Insomnia symptoms may in part be due to nocturnal hot flashes (HFs) associated with chemotherapy and hormone therapy.
- Inconsistent results have been found on the relationship between HF frequency and standard polysomnographic (PSG) sleep parameters.
- Other characteristics of HFs such as their intensity and duration may better account for PSG-assessed sleep impairments, while quantitative sleep EEG (spectral power) may be more sensitive to HFs.

STUDY GOAL

This cross-sectional study aimed at assessing the relationship between various characteristics of objectively-recorded nocturnal HFs and sleep disturbances in breast cancer patients.

METHODS

Participants

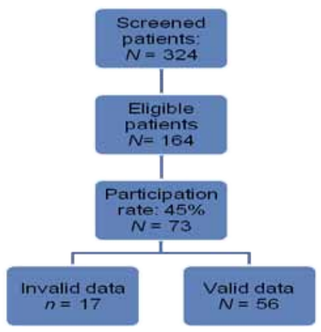
Fifty-six women with breast cancer participated in this study. Patients were solicited from a larger longitudinal study or at the radio-oncology department of L'Hôtel-Dieu de Québec (CHUQ).

Inclusion criteria:

- Between 30 and 70 years of age
- Having received a first diagnosis of non-metastatic breast cancer
- Having completed in the past four months a treatment protocol combining surgery, chemotherapy and radiotherapy
- Have been receiving hormone therapy for breast cancer for a minimum of five weeks

Exclusion criteria:

- A diagnosis of sleep disorder other than insomnia
- Having received neoadjuvant chemotherapy for breast cancer
- Having any medical, neurological or psychological disorder that is known to significantly alter sleep
- Occasionally or regularly using any medication (other than psychotropic medication) known to significantly affect sleep



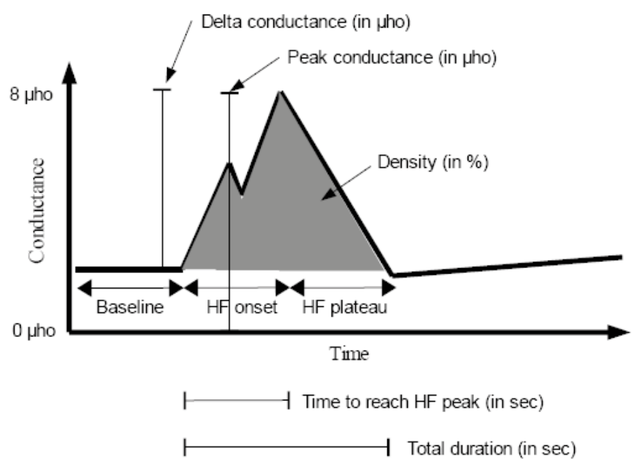
Participants' characteristics

Variable	*M (SD)*
Age	51.8 (7.6)
BMI	25.7 (4.8)
	%
Marital Status	
Married/Cohabitating	58.9
Education	
College or University degree	62.5
Annual Family Income (in Canadian dollars)	
$60 000 and higher	46.5
Occupation	
Sick leave	60.7
Menopausal status at diagnosis	
Pre	57.8
Peri	6.3
Post	35.9
Past hormone replacement therapy use	26.6
Use of a medication to manage HFs	
venlafaxine, paroxetine or gabapentin	23.2
Use of another psychotropic medication	42.9
Cancer Stage	
I	23.2
II	48.2
III	28.6

Measures

All participants wore an ambulatory device of sternal skin conductance and PSG for a single home-based nighttime recording of HFs and sleep.

- Polysomnography (PSG): Notta® device (Stellate Systems, Montréal, QC, Canada)
- Sternal skin conductance: an amplifier connected to the Notta® device
  - HFs were automatically coded using an increase in SSC of at least 1.2 micro siemens (µmho) within a 30-second period as the criterion (MH Savard et al., in preparation).
  - The following HF characteristics were assessed:
    - peak conductance
    - differential conductance (delta)
    - time to reach the HF peak
    - total duration
    - density



Statistical Analyses

- Potential covariates investigated: age, the periodic limb movement index (associated with arousals), psychotropic medication use, and minimal and maximal temperature in the bedroom during the night.
- The relationship between nocturnal HF characteristics, PSG-assessed sleep disturbances and spectral power was examined using partial Spearman correlation analyses (with age as a covariate).

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RESULTS

Relationship between nocturnal hot flashes and PSG parameters

Polysomnography	HF frequency (*N* = 56)	Other Characteristics of Hot Flashes (*n* = 30)				
		Peak conductance	Delta conductance	Time to peak	Duration	Density
Sleep onset latency	.00	.22	.09	.05	.16	-.13
REM sleep latency	-.18	.04	.09	-.07	-.02	-.15
Total wake time	.18	.24	.07	**.42***	.07	.17
Wake after sleep onset	.18	.15	.18	.29	-.02	.15
Sleep efficiency	-.16	-.23	-.05	**-.44****	-.09	-.21
REM 1st third of the night (min.)	.21	.04	-.08	-.22	**-.50****	-.12
REM 2nd third of the night (min.)	-.01	.03	-.14	-.26	-.19	-.30
REM 3rd third of the night (min.)	.08	.24	.21	.15	.10	-.12
Total number of awakenings	.04	.27	.08	-.06	.28	-.33[a]
Nb. of awakenings < 1 min.	.15	.07	.06	**.38***	.08	.23
Nb. of awakenings < 3 min.	.03	.16	-.02	**.48****	-.02	.29
Nb. of awakenings < 5 min.	.05	.21	.09	.34[a]	-.03	.13
Stage 2 sleep (%)	.04	-.01	.32[a]	.15	.18	.14
Stage 3-4 sleep (%)	.00	-.19	-.31	.10	-.11	.22
REM sleep (%)	.11	.13	-.07	-.16	-.33[a]	-.29

[a] $p < .10$; * $p < .05$; ** $p < .01$

Relationship between Hot Flashes and Spectral Power

Spectral Power	HF frequency (*N* = 47)	Other Characteristics of Hot Flashes (*n* = 23)				
		Peak conductance	Delta conductance	Time to peak	Duration	Density
0.00 - 0.78 Hz (slow)	**.28***	.28	.25	.04	-.08	.01
0.78 - 3.13 Hz (delta)	**.32***	.17	.26	.05	-.13	.08
3.13 - 7.03 Hz (theta)	-.01	.00	-.01	.01	-.10	.23
7.03 - 11.33 Hz (alpha)	-.04	-.07	-.04	.28	.09	.23
11.33 - 13.67 Hz (sigma)	.03	-.12	-.04	.11	.23	.12
13.67 - 21.48 Hz (beta-I)	.03	-.07	-.02	-.07	.30	-.08
21.48 - 30.08 Hz (beta-II)	-.01	-.21	-.08	.01	.27	-.15

* $p < .05$

Descriptive statistics for HFs and sleep

Variable	Mean	Range
Hot Flashes (*N* = 30)[a]		
Peak conductance (µmho)	4.6 ± 4.1	2.4–17.4
Delta conductance (µmho)	3.0 ± 1.4	1.3–6.3
Time to peak (sec.)	93.8 ± 59.6	13.0–282.0
Duration (sec.)	277.5 ± 54.9	49.0–299.0[b]
Density (%)	58.2 ± 11.5	39.9–82.8
Polysomnography (*N*=56)		
Sleep onset latency (min.)	21.7 ± 14.4	4.3–68.0
REM sleep latency (min.)	111.6 ± 54.2	34.3–246.3
Total wake time (min.)	77.4 ± 36.4	21.3–211.7
Wake after sleep onset	53.9 ± 32.8	6.7–151.0
Sleep efficiency (%)	84.2 ± 7.3	56.6–94.9
REM 1st third of the night (min.)	12.7 ± 11.6	0–45.3
REM 2ND third of the night (min.)	31.5 ± 12.9	0–58.0
REM 3rd third of the night (min.)	42.1 ± 18.1	0–79.7
Total number of awakenings (>10 sec.)	40.8 ± 15.9	12–100
Nb. awakenings > 1 min.	13.3 ± 5.2	4–31
Nb. awakenings > 3 min.	5.1 ± 2.7	1–16
Nb. awakenings > 5 min.	3.3 ± 2.1	0–13
Stage 2 sleep (%)	57.9 ± 7.7	34.6–74.7
Stage 3-4 sleep (%)	5.9 ± 5.2	0–24.4
REM sleep (%)	20.7 ± 5.4	6.6–34.4
Spectral Power (*N* = 47)		
0.00–0.78 Hz (slow)	50.8 ± 56.3	13.8–381.2
0.78–3.13 Hz (delta)	72.4 ± 58.2	26.8–413.5
3.13–7.03 Hz (theta)	25.0 ± 12.0	10.4–86.6
7.03–11.33 Hz (alpha)	11.9 ± 6.1	5.1–36.3
11.33–13.67 Hz (sigma)	3.2 ± 1.4	1.2–6.7
13.67–21.48 Hz (beta-I)	7.9 ± 4.5	2.3–27.4
21.48–30.08 Hz (beta-II)	5.6 ± 6.2	1.1–34.8

[a] HF data comes from the 30 participants (of 56) who had HFs during the recording night;
[b] The maximum possible duration is 299 seconds.

CONCLUSION

- Slower and longer HFs appear to contribute more importantly to sleep alterations than HF frequency.
  - Slow developing HFs may be associated with more enduring symptoms, such as heating or sweating, which in turn could increase the propensity for sleep impairments.
  - It would be interesting to investigate in the future whether these types of HFs are also perceived by the patients as being more bothersome. If so, then looking for HFs presenting with these specific characteristics might increase the concordance between subjective and objective assessments of HFs, which have typically been found to be weakly correlated.
- A higher frequency of nocturnal HFs is associated with greater spectral power in the slow and delta frequency bands.
  - This may correspond to a recovery process following sleep disturbances associated with HFs, as greater spectral power in the slow and delta frequency bands is indicative of increased homeostatic sleep drive and sleep preservation.