P-628 ATYPICAL TEMPERATURE PATTERNS AS AN AID TO IDENTIFY INFERTILITY ISSUES AND MISCARRIAGE RISK

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Study Question

To determine if ovulatory abnormalities and risk of miscarriage were associated with atypical Patterns of vaginal core body temperature (CBT) measurements from the OvuSense system.

Study Design, Size, Duration

Retrospective, longitudinal, comparative, observational study. Participants used OS vaginally at night to monitor CBT when not menstruating. The total study population (TSP) was 18,679 ovulatory cycles from 8,653 OS users recorded between March 2016 and December 2019. A detailed medical questionnaire was then issued to study participants and the answers from 375 respondents accounting for 1,491 of the TSP cycles was used for further assessment.

What Is Known Already?

Three novel, atypical CBT Patterns published previously, confirmed in updated population of 18,679 ovulatory cycles: (A) "Crash To Baseline" = first nightly averaged CBT falls by >0.2 degrees Celsius (^{0}C) to lowest cycle CBT point (baseline), (B) "False Start" = rise of >0.1^{0}C did not result in ovulation but instead a return to baseline CBT followed by ovulation two or more days later in the cycle, (C) "Crash After Ovulation" = final CBT >0.2^{0}C lower than the post ovulatory peak CBT. It is likely OS patterns closely reflect progesterone changes, hence cycle-related hormonal abnormalities may be associated with atypical patterns.

Participants/ Materials, Setting, Methods

TSP used to confirm prevalence of cycle Patterns (A)-(C); and questionnaire assessed per respondent for each following existing 'Diagnosis': 1. Any infertility related diagnosis, 2. PCOS, 3. PCOS and regular cycles ;4. Previous miscarriage = gravida >0, number of miscarriages >0. Diagnostic Odds Ratio (OR) calculated as (w/x)/(y/z) for each Pattern + Diagnosis combination together with their 95% confidence interval: w. Positive Diagnosis (+D), Pattern >1 cycle for respondent (+P); x. -D+P; y. +D-P; z. -D-P.

Results

18,679 cycles from 8,653 OS users in Total Study Population (TSP). Detailed medical questionnaire then responded to by 375 users accounting for 1,491 cycles.

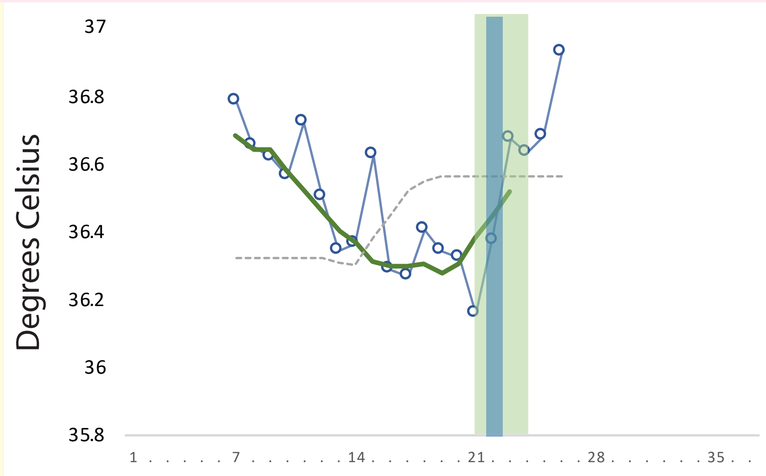
Example Cycle Details
a. OS user age
b. Trying to conceive
c. Length for this cycle
d. OS recordings taken
e. Confirmed ovulation
f. CBT pattern for user

Study Prevalance Details

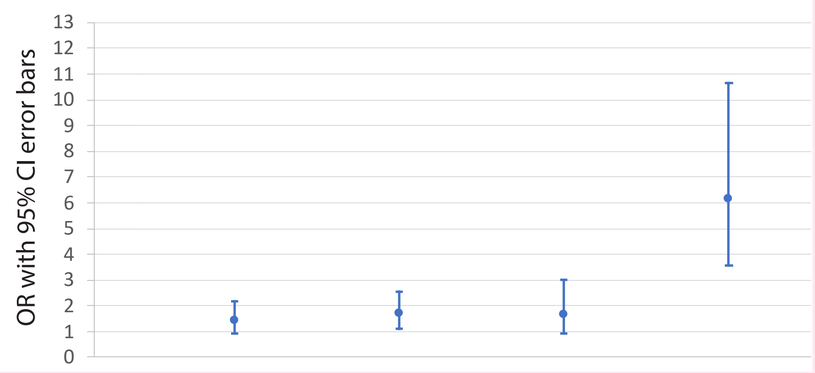
	Historic Diagnosis 1. Any infertility related diagnosis	Historic Diagnosis 2. PCOS	Historic Diagnosis 3. PCOS with regular cycles	Historic Diagnosis 4. Previous miscarriage
upper CI	2.18	2.56	3.00	10.63
OR	1.44	1.69	1.67	6.17
lower CI	0.95	1.12	0.93	3.59

(A) "Crash To Baseline" = first nightly averaged CBT falls by >0.2 ^{0}C to lowest averaged CBT point in cycle (baseline)

example
a. *37*
b.1-2 years prior to OS
c. 26 days
d. from day 7 to day 26
e. day 22
f. 3/ 7 recorded cycles

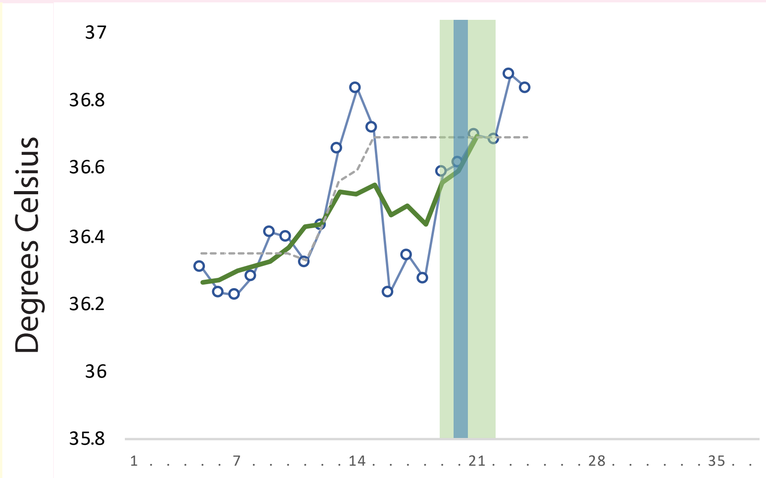


263 cycles (17.6%) from 164 respondents (43.7%)



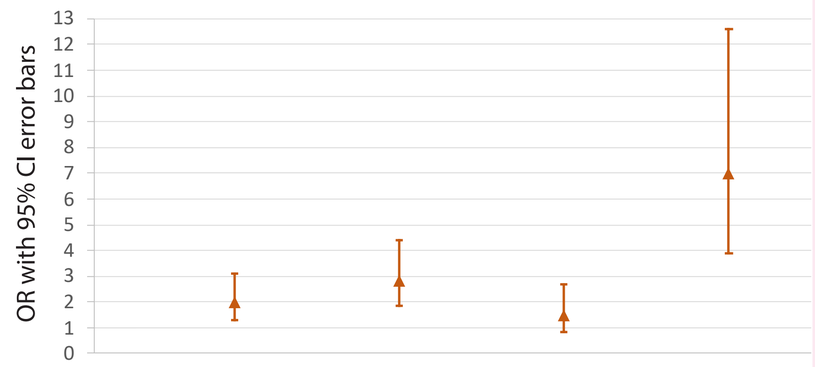
(B) "False Start" = rise of >0.1 ^{0}C did not result in ovulation but instead a return to baseline CBT followed by ovulation two or more days later in the cycle

example
a. *30*
b. 0-6 months prior to OS
c. 24 days
d. from day 5 to day 24
e. day 20
f. 3/ 7 recorded cycles



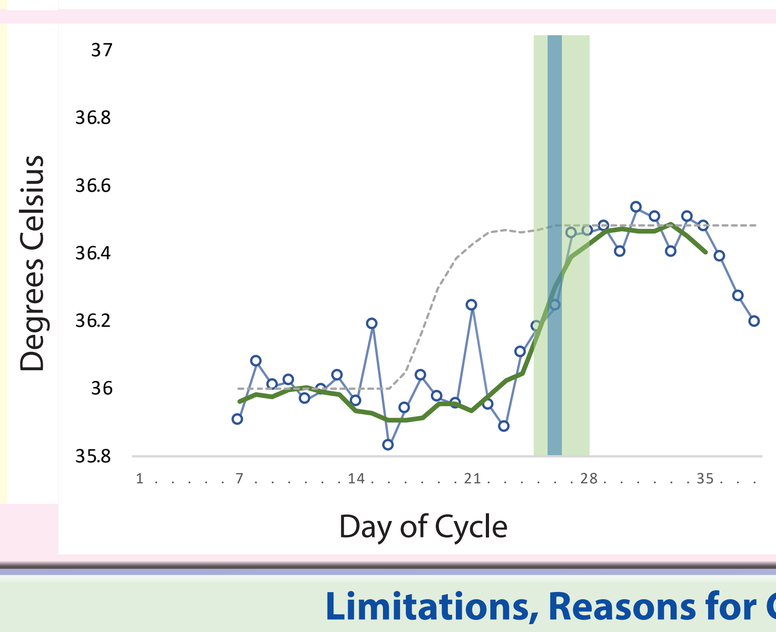
202 cycles (13.5%) from 133 respondents (36.5%)

upper CI	3.11	4.39	2.67	12.57
OR	1.99	2.84	1.48	6.99
lower CI	1.28	1.83	0.82	3.89



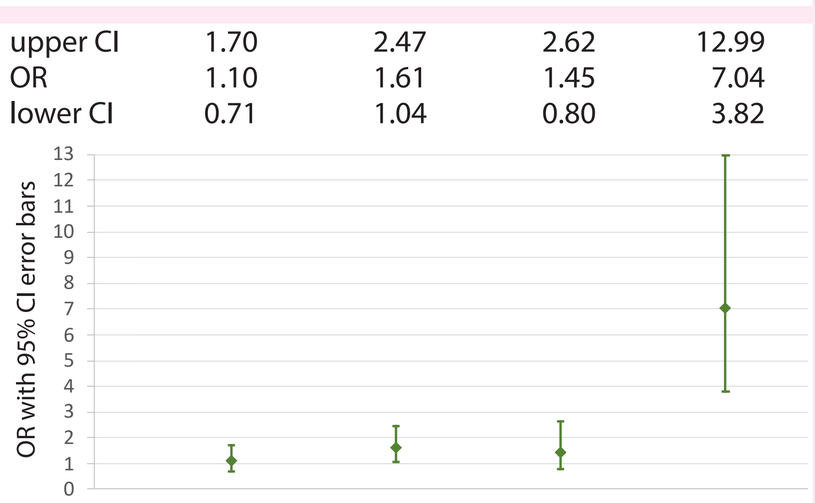
(C) "Crash After Ovulation" = final "raw" CBT>0.2 ^{0}C lower than the post ovulatory peak averaged CBT

example
a. *29*
b. Not provided
c. 38 days
d. from day 7 to day 38
e. day 26
f. 6 / 10 recorded cycles



216 cycles (14.4%) from 128 respondents (34.1%)

upper CI	1.70	2.47	2.62	12.99
OR	1.10	1.61	1.45	7.04
lower CI	0.71	1.04	0.80	3.82



The Role of Chance

These results indicate strong associations between reported Historic Diagnosis and the atypical CBT Patterns identified using the OS system. The high OR for each Pattern associated with miscarriage merits further investigation, as the cohort has a low pregnancy rate.

Limitations, Reasons for Caution

The authors note the co-existence of Pattern + Diagnosis is not strictly "predictive", as each Diagnosis is by definition historic. The population is by definition biased to one or more Historic Diagnosis as over 57% of respondents report having been trying to conceive for a year or more prior to use.

Wider Implications of the Findings

Results suggest that atypical CBT Patterns may aid diagnosis, and in particular elevated risk of miscarriage. It should be noted that the absence of an existing Historic Diagnosis does not necessarily render the results with positive Patterns "false", and the existence of a Pattern could anyway indicate investigation for ovulatory abnormalities.

References

1. Hurst BS, Pirrie A (2019) Atypical vaginal temperature patterns may identify subtle not yet recognised causes of infertility P-345 American Society for Reproductive Medicine 75th Annual conference.
2. Papaioannou S, Delkos D, Pardey J (2014) Vaginal core body temperature assessment identifies pre-ovulatory body temperature rise and detects ovulation in advance of ultrasound folliculometry. ESHRE 30th Annual Conference.

Trial Registration Number

Atrium Health IRB File #03-19-16E

Study Funding/ Competing Interests

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Explanation of Charts

OS plots standard charts on a daily basis. The blue line shows the best representative "raw" CBT value produced by the OS algorithm for each set of overnight measurements taken every 5 minutes. The green "smooth" weighted average CBT curve is used by the OS algorithm to predict ovulation up to 24 hours in advance using this current cycle's data, and then confirm ovulation.
A grey "textbook" smoothed curve has been added to these charts for the purpose of this paper to show the typical pattern which might have been expected for this cycle, taking into account an expected "textbook" middle of the cycle ovulation.

Representative "raw" CBT overnight values | "smooth" weighted averaged CBT analysis | "textbook" smoothed curve for this cycle | Green shading is "ovulation window" from ovulation day -1 to ovulation day +2 | Blue shaded line is OvuSense detected day of ovulation