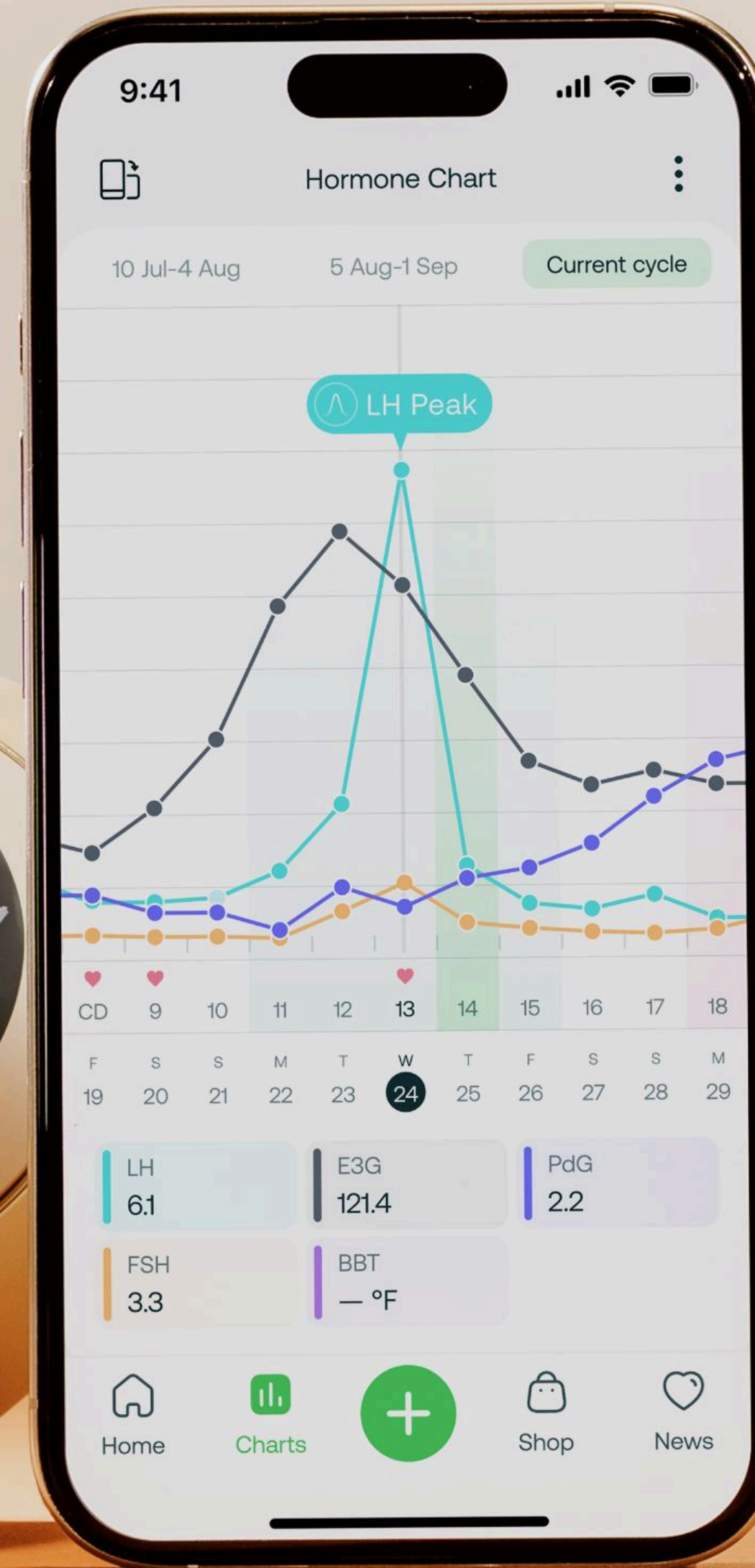


Hormone Testing in Perimenopause & HRT Care: Insights from Dr. Carrie Jones and Mira

mira

for Healthcare Professionals





Rose MacKenzie

Clinical Manager
at Mira

Rose MacKenzie is the Clinical Manager at Mira, where she assists healthcare professionals in effectively integrating Mira's hormone monitoring tools into their practices.

Rose is well-equipped to provide education and support to providers and fertility awareness educators. Additionally, Rose brings nearly a decade of experience as a natural family planning instructor, specializing in the Marquette and Sympto-Thermal Methods.



Dr. Carrie Jones

ND, FABNE, MPH,
MSCP

Dr. Carrie Jones is a globally recognized speaker, author, and educator in women's health and hormones, with over 20 years of experience. A Naturopathic Physician and Menopause Society Certified Practitioner, she completed a residency in women's health and endocrinology, earned a Master of Public Health, and was among the first board-certified by the American Board of Naturopathic Endocrinology. Dr. Jones has held leadership roles at Precision Analytical (DUTCH Test), Rupa Health, and NuEthix Formulations, and is the host of the Hello Hormones Podcast.

Agenda

01. Disclaimer: Indications for Testing in Perimenopause

02. Hormone testing in perimenopause

03. Relationship between estradiol and FSH

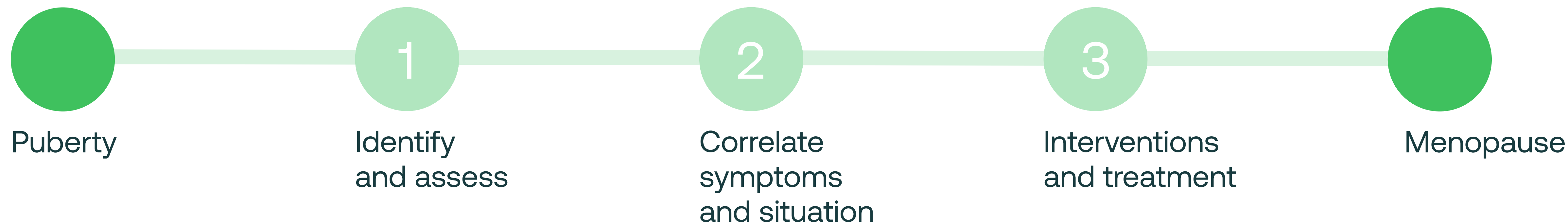
04. FSH Research

05. Case Report

06. Q&A



Disclaimer: Indications for Hormone Testing Overview



Disclaimer: We must acknowledge that there is ongoing debate in the medical community about the utility of hormone testing during perimenopause

Goal: To clearly define:

1. Who benefits from hormone testing
2. When it is appropriate to test

Hormone fluctuations occur throughout the reproductive lifespan—from puberty to menopause—and often indicate a clinical reason for testing.

However, in perimenopause, hormone patterns are especially dynamic.
➡ This stage presents specific indications where testing can offer actionable insights to support diagnosis, symptom correlation, and treatment planning.

02

Hormone testing in perimenopause



Identify and Assess: Is my patient ovulating?

Can you confirm ovulation—regardless of birth control, HRT, or current interventions?



Ovulatory Cycle – 50 Year Old Female

- Coordinated rising E3G leading to LH surge
- LH surge on CD 15 and CD 16 triggering ovulation
- Rising PdG after the LH surge confirms ovulation
- Suboptimal PdG pattern with persistently low levels

Anovulatory Cycle – 50 Year Old Female

- Rising E3G, lack of coordination with LH
- Lack of LH surge
- Lack of PdG changes



Identify and Assess: Are the hormones balanced, coordinated, excessive, or deficient?

Abnormal E3G during an anovulatory cycle

Patient Details

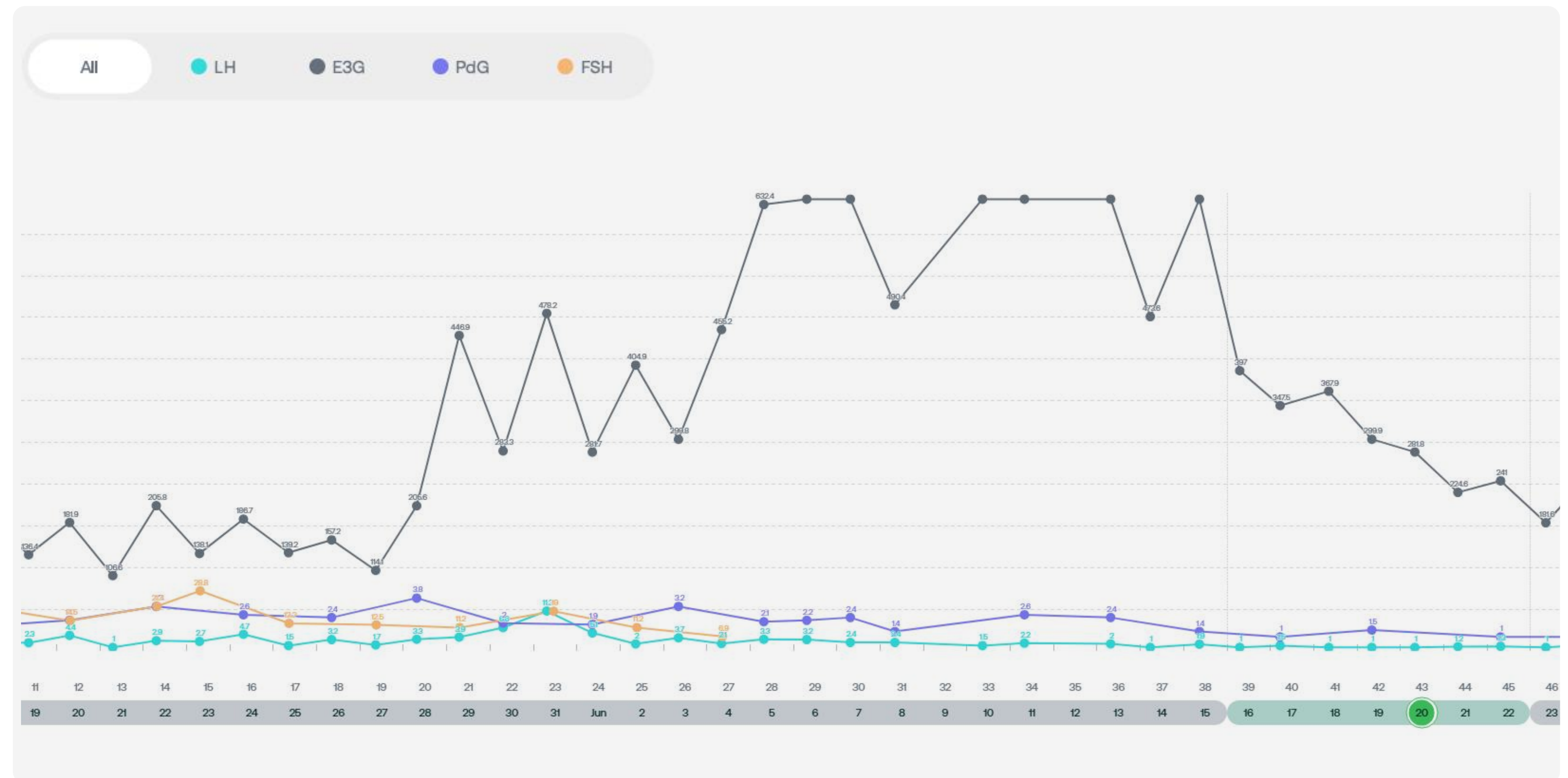
49 year old with ongoing elevated E3G

Mira data discovered

Rising and sustained elevated E3G without coordinated LH surge

Lack of PdG changes

Anovulatory cycle





Identify and Assess: Are the hormones balanced, coordinated, excessive, or deficient?

E3G deficiency and E3G excess in the same anovulatory cycle

Patient Details

45 female

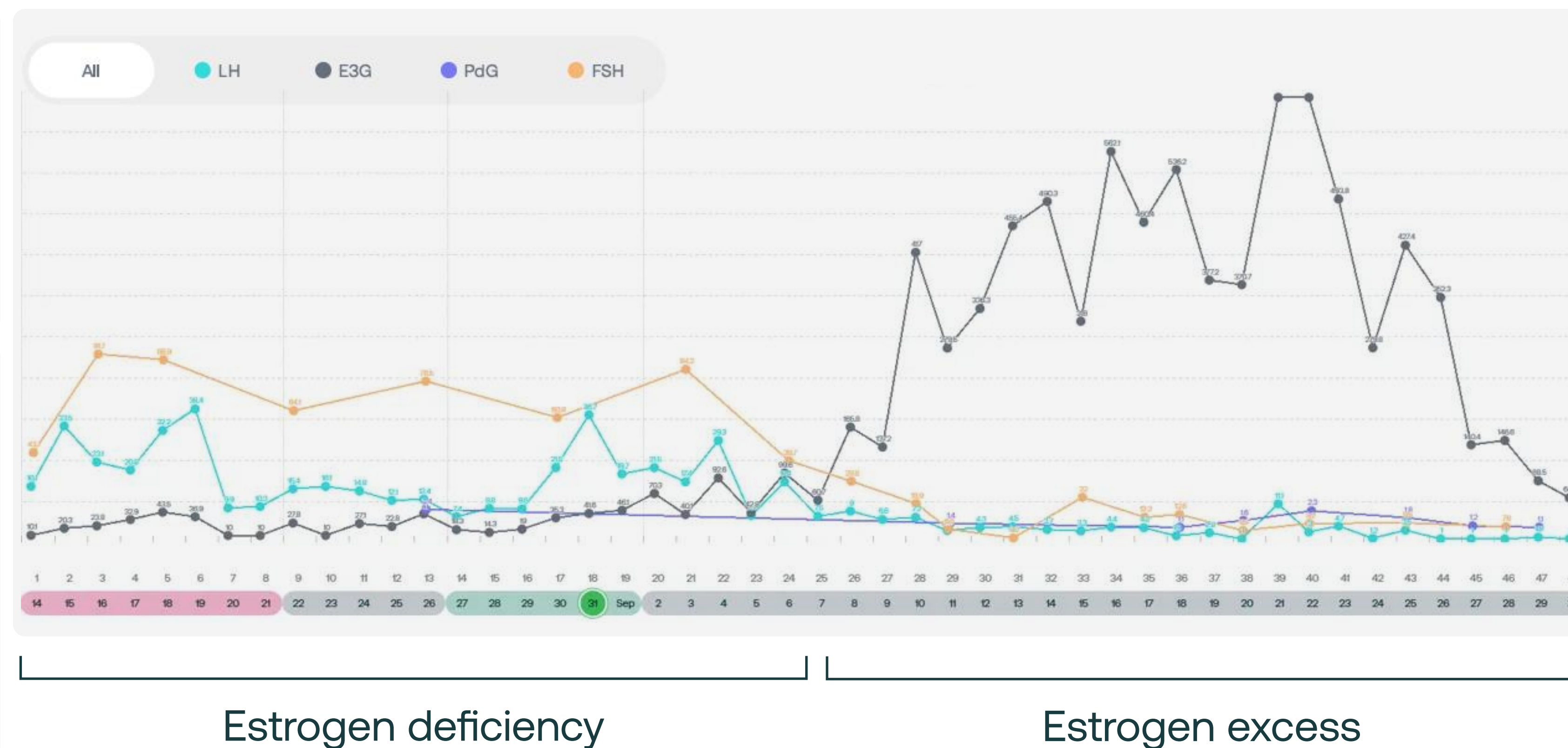
Irregular cycles

Mira data discovered

Initially elevated FSH and LH levels with low E3G

Then E3G rises and FSH is suppressed

Anovulatory cycle





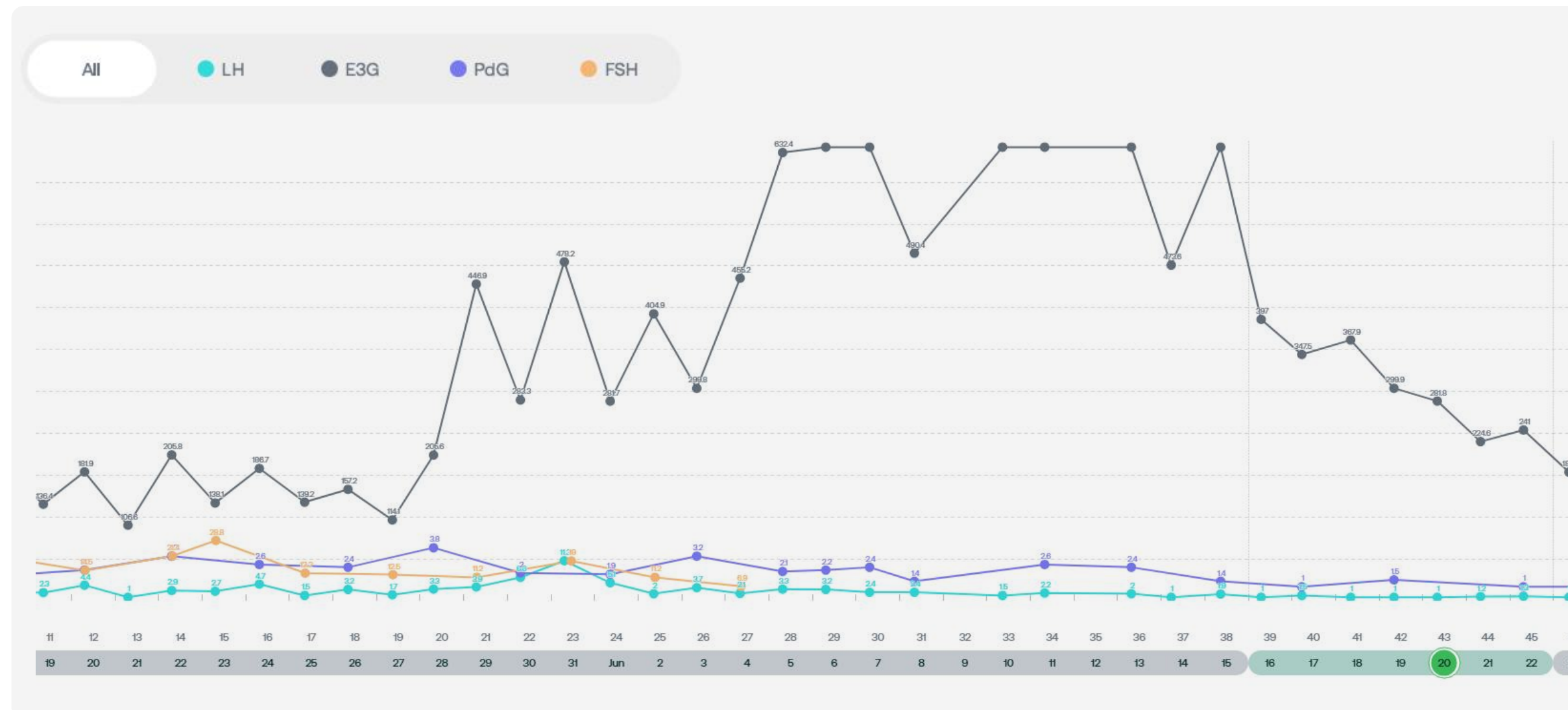
Correlate Symptoms and Situation

Understanding Symptom Presentation in Relation to Hormone Trends

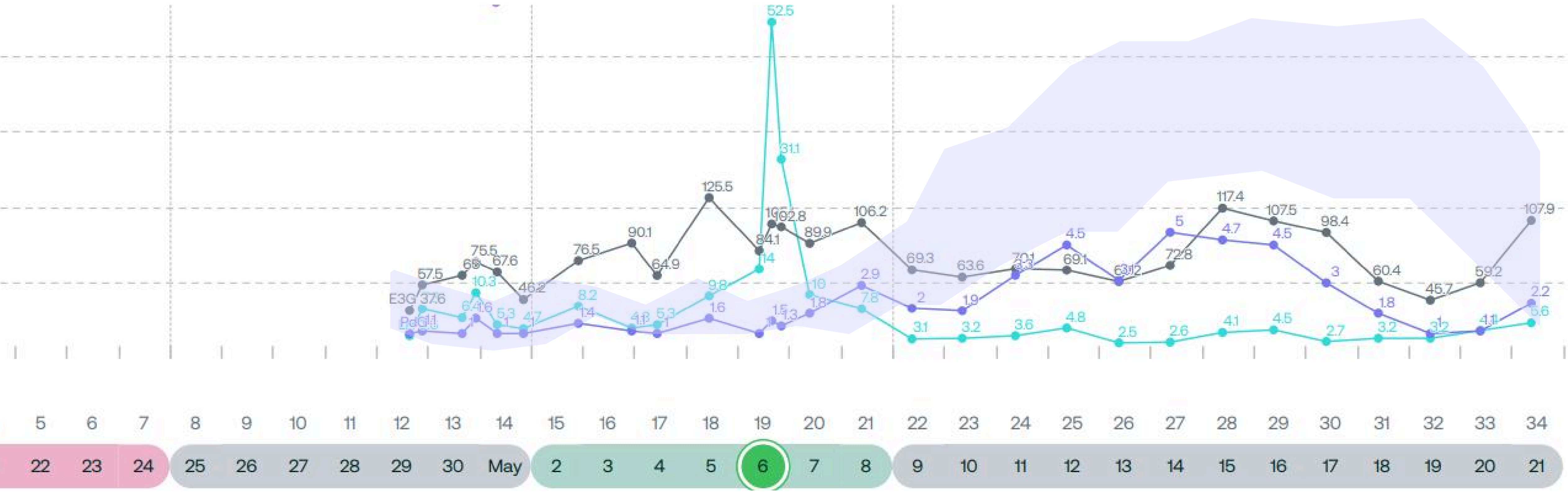
Ovulatory cycle with coordinated hormone patterns but suboptimal PdG levels



Anovulatory cycle with elevated E3G, low PdG, and lack of hormonal coordination



Low progesterone identified





Evaluating Intervention Options

Leveraging Hormone Trends Guide Clinical Interventions

 Consider

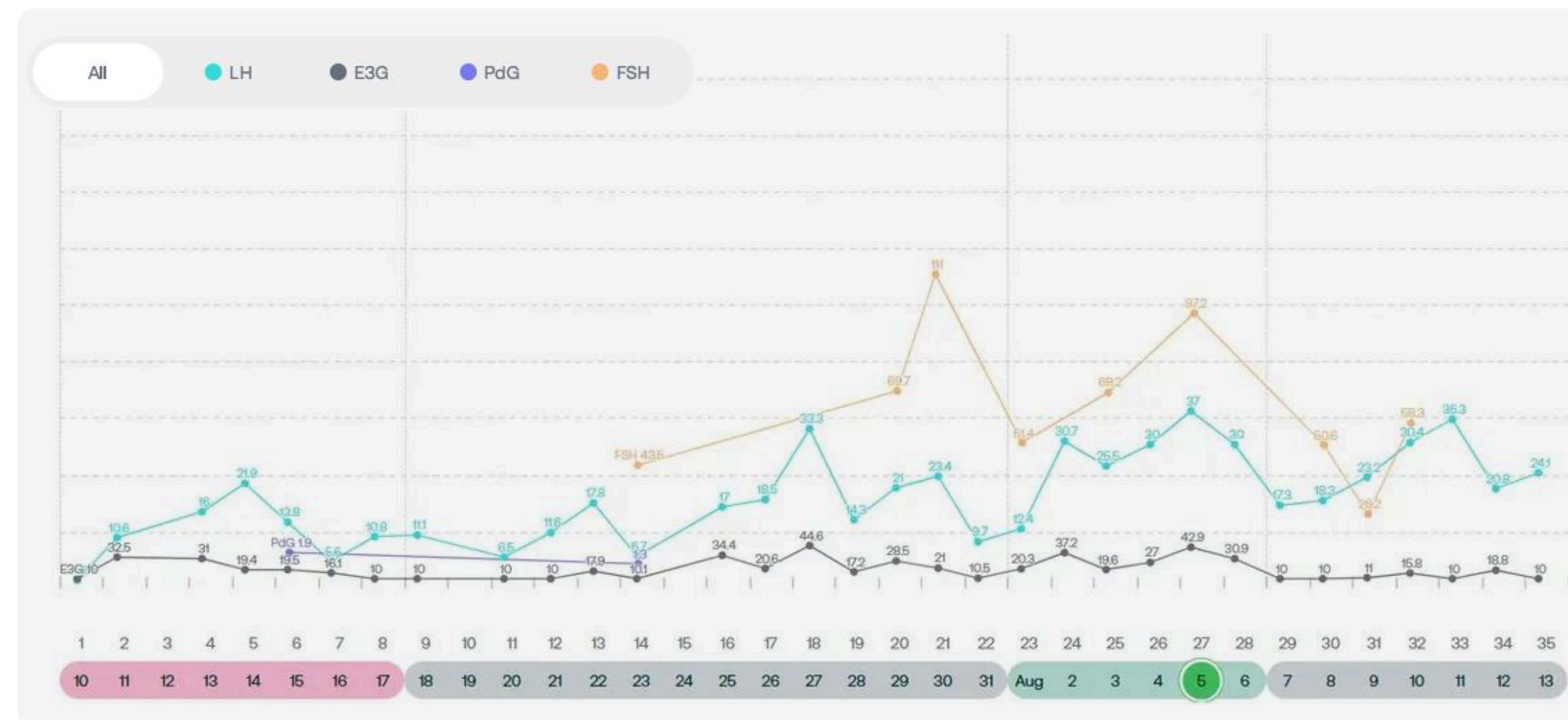
Timed-cyclic progesterone



 Consider

Estrogen therapy

Generic cyclic or daily progesterone



Appendix: Brief Table Version

Overview of Clinical Insights on Hormonal Monitoring with Mira in Perimenopause Management

Section 1: Hormone Tracking	Details	Mira helps with	Clinical Observations (Used for)	Clinical Observations (Not used for)
PdG (Pregnanediol Glucuronide) Monitoring: A Metabolite of Progesterone	Progesterone decline from reduced luteal secretion and ovulation, plus unopposed estrogen, can contribute to transition-related symptoms.	Mira helps identify low progesterone levels or irregular progesterone patterns.	Timing progesterone after ovulation in the luteal phase maintains natural hormonal rhythm, avoiding disruption from a generic cycle.	Mira does not assess therapeutic progesterone levels or determine if supplementation is too high or low. See more below.
E3G (Estrone 3-Glucuronide) Monitoring: A Urinary Metabolite of Estradiol (E2)	Perimenopause involves declining ovarian function, irregular cycles, unopposed estrogen, and fluctuating estradiol with low progesterone.	Mira helps identify low E3G, high E3G, or abnormal patterns, including absent mid-follicular rise and luteal out-of-phase events.	Mira helps identify symptoms linked to estrogen abnormalities, track estrogen patterns, and detect irregular cycles with multiple ovulation attempts.	Mira measures the urinary metabolite of estradiol (E2), E3G (estrone 3-glucuronide), but does not assess the full estrogen metabolism pathway.
LH monitoring	A study linked variable LH patterns and negative LH feedback to increased VMS, with low progesterone associated with VMS, not mood.	Mira enables LH pattern assessment, tracking ovulation and PdG changes, providing a comprehensive view of hormonal cycle effectiveness.	Mira helps assess LH patterns, providing insights into cycles, ovulation, and hormonal imbalances to guide fertility, HRT, and lifestyle decisions.	Mira tracks LH levels and ovulatory patterns but cannot diagnose conditions like PCOS. Use it alongside other clinical assessments.
FSH monitoring	FSH rises during perimenopause but fluctuates; interpretation should be cautious alongside E3G due to cycle variability.	Elevated FSH signals ovarian decline, common in perimenopause, and helps monitor hormonal changes throughout the menstrual cycle.	FSH helps monitor ovarian function, treatment progress, and cycle variations; a decline is expected after starting estrogen therapy.	FSH is useful for monitoring ovarian function and treatment progress, but cannot predict TTC outcomes or menopause timing.
Section 2: Hormonal supplementation and HRT	Details	Mira helps with	Clinical Observations (Used for)	Clinical Observations (Not used for)
Progesterone topical/transdermal application	Topical hormones may slightly increase PdG excretion; tracking PdG helps monitor natural progesterone patterns.	Mira helps assess if the patient's hormone pattern is ovulatory or changing, guiding the need for alternative treatment.	Mira helps time progesterone administration during the luteal phase and assess treatment response, supporting ovulation and cycle regularity.	Mira does not assess therapeutic progesterone levels; PdG levels do not indicate if the supplemental dose is too high or low.

Section 2: Hormonal supplementat ion and HRT

Progesterone systemic
(oral, vaginal, injectable)

Details

Systemic oral/injectable hormones raise serum and urine metabolites, while compounded vaginal progesterone may raise urine metabolites variably.

Mira helps with

PdG often reaches Mira's upper limit (30) with supplementation, limiting endogenous assessment. Indirect effects—like symptom changes, luteal phase length, and estrogen balance—can still be monitored.

Clinical Observations (Used for)

Mira helps time progesterone during the luteal phase supporting the natural physiology of ovulation.

Clinical Observations (Not used for)

Mira does not assess therapeutic progesterone levels; PdG levels cannot determine if the supplemental dose is too high or low.

Estrogen
Supplementation
Therapy

Estrogen therapy effectively alleviates perimenopausal symptoms and supports bone density and cardiovascular health, tailored to individual needs.

Mira provides hormonal pattern insights, helping providers determine the optimal timing for initiating estrogen therapy.

Mira identifies low or high estrogen levels, correlates symptoms with treatments, and helps determine the optimal timing for starting estrogen therapy.

E3G levels don't determine therapeutic serum E2 levels; some providers correlate serum levels with Mira data to track changes.

Estrogen Therapy:
Systemic Topical/
Transdermal
Applications (Patches,
Creams, and Gels)

Systemic estrogen increases serum estradiol and E3G levels, with topical and transdermal estrogen therapies more significantly affecting E3G than topical progesterone affects PdG.

Mira helps identify endogenous hormone patterns and tracks linear, dose-dependent increases following supplementation.

Determine if the patient's underlying endogenous hormone pattern is changing and assess the need for alternative treatment.

E3G levels don't determine therapeutic serum E2 levels; providers correlate serum data with Mira to track hormonal patterns over time.

Estrogen Therapy:
Locally Absorbed
Topical Applications

Topical skin or vaginal estrogen may not affect serum estradiol or Mira data, but vaginal estrogen use risks contamination.

Tracking E3G levels allows you to identify the underlying endogenous estradiol hormone pattern.

Determine the patient's underlying endogenous hormone pattern.

Mira cannot determine whether the local estrogen is achieving its desired outcome.

Estrogen Therapy: Oral
Administration

Oral estrogen supplementation, which increases serum hormone levels, will also elevate urine metabolites.

Mira E3G levels will reflect the rise in estradiol, likely reaching the upper threshold of 640.

FSH, LH, and PdG levels track estrogen's effect on ovulation and hormones, with FSH changes assessed in response to E3G supplementation.

Mira cannot monitor endogenous estradiol with oral estrogen; E3G levels are not designed to determine therapeutic serum E2 levels.

Pellet HRT

Expect to see elevated serum levels.

No data at this time

No data at this time

No data at this time

DHEA supplementation

DHEA, produced by the adrenal glands, peaks in early adulthood and declines with age, serving as a precursor to estrogen and testosterone.

Expected findings include an increase in E3G levels due to the rise in serum estradiol.

Monitor E3G changes with DHEA supplementation to assess hormone balance and ovulation, with potential increases in E3G and PdG.

Cannot be used for determining therapeutic dosing of DHEA.



Overview of Hormone Testing with Mira in Perimenopause: Clinical Applications and Limitations

Clinical Indication	Yes	Limited	No
Identify and Assess			
Hormone cycle mapping	✔	-	-
Assess hormone patterns in ovulatory and anovulatory cycles	✔	-	-
Evaluate hormone patterns in a previously stable perimenopause patient	✔	-	-
Correlate symptoms and situation			
Correlate symptoms with hormone patterns	✔ Symptoms can be tracked alongside hormone patterns in the Mira app and viewed in the provider dashboard.	⚠ Not all symptoms directly correlate with hormonal fluctuations.	-
Interventions and Treatment			
Assist with timing of interventions, procedures, diagnostics, and other timed strategies	✔	-	-
Evaluate hormone shifts following supplements or lifestyle changes	✔	-	-
Determine therapeutic levels of HRT based on urinary metabolite values alone	-	-	✘ Insufficient data.
Assess whether HRT dosage adjustments may be appropriate by evaluating hormone patterns in conjunction with clinical context and patient symptoms.	✔ Phase-specific HRT ✔ Timed-cyclic progesterone ✔ Physiologic HRT ✔ Personalized HRT based on situation, symptoms, and hormone patterns	⚠ For specific types of HRT, Mira can show if ovulatory patterns are supported, when clinically appropriate.	✘ Standardized daily dosing regimen based on symptoms only and does not account for individual hormone fluctuations ✘ Pellet therapy (no data available at this time) ✘ Combination of oral estrogen and oral progesterone obscures endogenous hormone patterns due to a ceiling effect, limiting interpretability.
Monitoring hormone responses to HRT			
Monitoring endogenous hormones while taking HRT	✔ Topical progesterone ✔ Vaginal (local) estrogen - try to prevent contamination	⚠ Systemic estrogen therapy may result in dose-dependent, linear increases in E3G levels. However, additional endogenous estradiol production may exceed the expected rise from therapy alone and may be reflected in Mira data, suggesting an underlying shift in hormone patterns.	-
Post-menopause (more than 1 year past menopause)	-	⚠ For select HRT cases, Mira data may indicate estrogen absorption and metabolism (requires testing before and after therapy). Note: Standard reference ranges for HRT response have not yet been established. More guidance will be provided as data evolves.	-



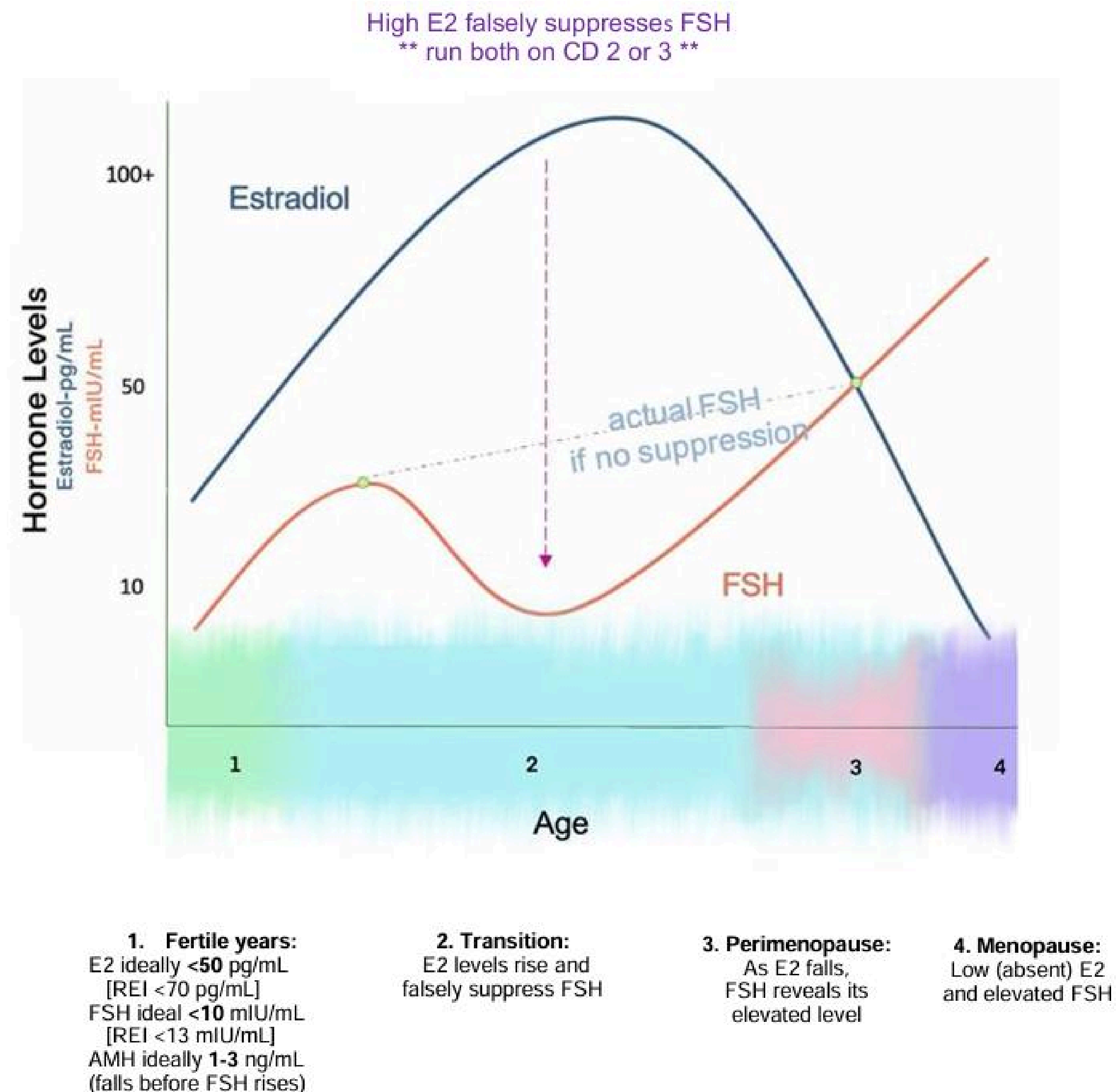
03

Relationship between estradiol and FSH



Relationship between Estradiol and FSH Across a Hormonal Lifespan

By Stefani K. Hayes, ND, LAc



References related to the fact that estradiol rises before it falls in DOR/perimenopause

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04

FSH Research



FSH Across the Menopause Transition: Why It Matters



FSH begins rising ~6 years before the final menstrual period¹

Women follow distinct FSH trajectories (low, medium, high rising)²

Postmenopausal FSH levels show large variation between women, independent of estradiol³

FSH trajectories may be more predictive of health outcomes than single measurements²

References: 1. Sowers et al., SWAN Study, 2008. 2. Randolph et al., 2011; Tepper et al., 2012. 3. Huang et al., 2024



FSH Beyond the Ovary: A Whole-Body Hormone

FSH receptors (FSHR) found in bone, adipose, pancreas, vasculature, and brain⁴⁻⁶

FSH directly stimulates osteoclast formation independent of estradiol⁷

FSH alters insulin and glucagon secretion in pancreatic islet cells⁸

FSH promotes lipid accumulation and adipogenesis⁹

FSH signaling influences neuronal activity and amyloid/tau production¹⁰



Clinical Outcomes Linked to FSH Levels

Bone: Higher FSH associated with \uparrow bone turnover & \downarrow BMD, independent of estradiol¹¹

Fracture risk: Higher FSH predicts hip fracture, even after adjusting for sex hormones¹²

Metabolic: Higher FSH linked to lower insulin & fasting glucose in some cohorts¹³

Cardiovascular: Elevated FSH associated with more aortic plaques & lipid accumulation¹⁴⁻¹⁵

Neurological: FSH increases amyloid & tau production; blocking FSH is neuroprotective¹⁶⁻¹⁷



Why Serial FSH Tracking Should Become Standard in Perimenopause

FSH rises years before estradiol declines, making it an early marker of transition¹

Identifies women with accelerated bone loss trajectories²

Helps guide timing of lifestyle changes (bone, metabolic health)³

Supports HRT counseling and monitoring of treatment effects⁴

Relevant as FSH-targeted therapies (antibodies, receptor blockers) advance toward trials⁵



FSH Feedback Through the Ovaries:

Estradiol (E2)—strong negative (and sometimes positive) feedback

Inhibin B & inhibin A—strong lever, when they drop, FSH rises

Activins (increases FSH) & follistatin (blocks activin)—local pituitary modulators that might influence bone and adipose more

Progesterone (weaker lever):

- Higher luteal progesterone → slower GnRH pulses → shifts LH/FSH output and can modestly suppress FSH.

Birth control pill lowers FSH usually

High dose androgens → aromatase → E2 to maybe reduce FSH (but this is a weak lever unlike direct ERT)

In postmenopausal women on combined E2 + progesterone therapy, FSH tends to be lower than in women on E2 alone in some datasets (though the main drop is from E2).

Tamoxifen in some women inhibit FSH

Hyperprolactinemia and serious hypothyroidism—suppresses FSH

Genistein, daidzein, equol, etc.—binds more to ERβ more than ERα compared to E2, may have mild FSH suppressing effects (but microbiome matters as most can't make equol)



Why FSH Tracking With Mira Matters for Clinical Practice

Identifies the start of the transition

FSH begins rising ~6 years before the final menstrual period and follows predictable trajectory patterns.

Refs: Santoro 2015; Randolph 2004

Makes sense of irregular cycles

Tracking FSH + LH + E3G + PdG helps distinguish anovulatory cycles from late or erratic ovulation as the ovaries become less predictable.

Ref: SWAN Study (Randolph 2004)

Reveals root-cause physiology

Higher FSH is linked to bone loss, metabolic syndrome, diabetes, adiposity, and cardiovascular changes — even when estrogen is still normal.

Refs: Sun 2006; Yeh 1996; El Khoudary 2017; Liu 2017



Why FSH Tracking With Mira Matters for Clinical Practice CONTINUED

Guides personalized treatment timing

Rising FSH predicts accelerated bone turnover, reduced BMD, and higher fracture risk, helping clinicians decide when to intervene with lifestyle, metabolic, or hormonal therapies.

Refs: SWAN (Sowers 2003); Sun 2006; Zhou 2024

Helps monitor therapy response

Serial FSH trends show how HRT, supplements, nutrition, or metabolic interventions are affecting whole-body physiology.

Refs: Bergamini 2024; Song 2016

Provides a missing piece of the puzzle

No other at-home tool offers continuous FSH tracking—despite strong evidence connecting FSH to bone, metabolic, adipose, and cognitive health.

Refs: Xiong 2022; Cheng 2023; Munir 2012

05

Case Report



Case report: Tracking Ovarian Recovery After Kidney Donation in Perimenopause

Using continuous hormone data to monitor the return of ovarian function and optimize HRT timing




Patient Background and History

 Female, 46 years old, BMI 22

 Hashimoto dx postpartum, in remission, significant mold exposure, and IBS/SIBO in remission

 1 child, conceived naturally at 40yo used Vitex for progesterone support

-  Medications:
- Copper IUD x 5 yrs
 - Cyclic OMP x 2 yrs
 - Testosterone transdermal cream x 1 year
 - Motegrity
 - Low dose naltrexone (LDN)


Cycle History Overview

- 30s:
 - Regular 28–29 day cycles
 - No PMS symptoms
- Age 42:
 - Cycles shortened to 23–26 days
 - New onset of premenstrual breast tenderness
- Initial Interventions & Outcomes:
 - Began cyclic oral micronized progesterone (OMP) → improved breast tenderness
 - Added ovarian bioregulators and epitalon → cycle length extended back to 27–29 days

Patient Situation

Before Mira



 Donated left kidney to sister 1/9/25. Intraoperative clamping of left ovarian and adrenal vessels (due to left sided anatomy relative to the kidney and main vessels). “Very difficult dissection.”

 Symptoms:

- Severe fatigue and cognitive dysfunction
- Did not bleed for about 3 months after donating her kidney
- Breasts became flat and mushy

 Previous Diagnostics/Labs:

- 2023 Dutch sex hormones fairly normal for age with optimal 2-oh estrogen metabolism path predominate
- Labs done many times 2024/2025 thyroid, nutrients, iron, cmp, cbc, crp = all normal
- Breasts: bilateral microcysts & microcalcifications, benign
- Two simple right ovarian cysts

 Recent Labs:

- FSH 50s
- Estradiol in the 30s

Interventions

Before Mira



Lifestyle

Started flax seeds daily in smoothie and using broccoli sprout powder most days

Supplements and medications

Estradiol patch

Daily oral micronize progesterone

Restarted ovarian bioregulators

Problem

She wanted an efficient way to monitor whether her clinical strategies were supporting her hormonal health and “reviving” ovarian function.

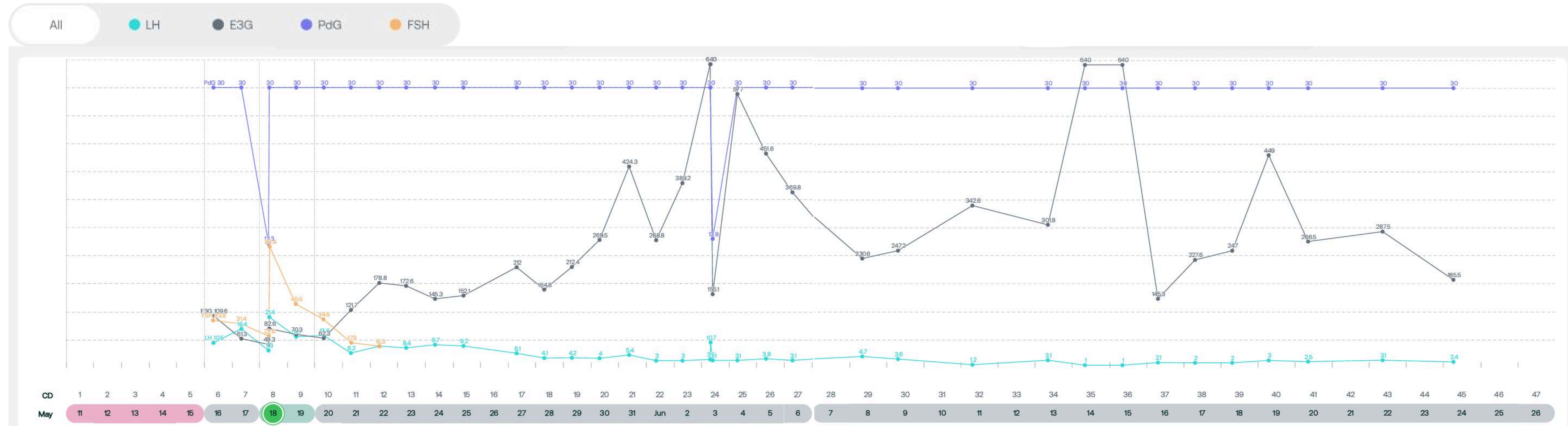
Weekly blood draws were burdensome and still too infrequent to capture meaningful hormonal shifts or confirm whether her endogenous hormone production was returning.

This need for accessible, frequent, at-home hormone monitoring led her to Mira.



Initial Mira data identified abnormal hormone patterns

Mira data during interventions



Mira data discovered

Initially elevated FSH and LH
FSH trends down as E3G rises

Note: Patient is taking oral progesterone making PdG reach the upper threshold.

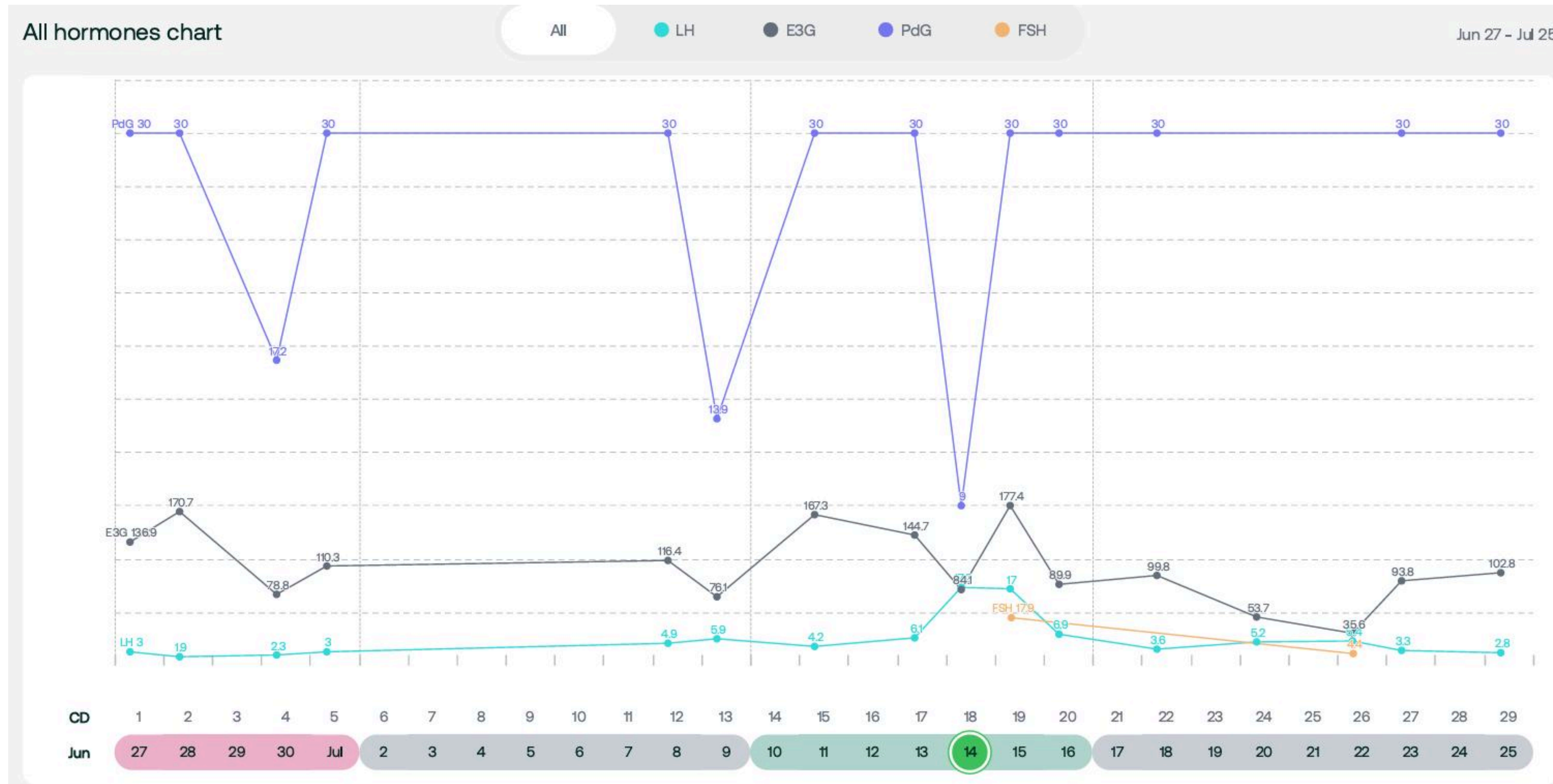
Interpretation:

About 3 weeks into the patch + bioregulators, she noted a rise in E3G on Mira. She paused the patch and repeat labs showed estradiol ~450 pg/mL, confirming the elevated E3G.



Monitoring progress throughout treatment and interventions

Return of hormone coordination, suspected ovulatory cycle



Mira data discovered

Hormone coordination and cycle length improvement from 47 days to 29

Lower overall E3G levels with ovulatory LH surge on CD 18 and CD 19

Luteal phase 10 days

Interpretation:

Moving forward was able to return to timed-cyclic progesterone. Did not restart estradiol patch.

Provider Testimonial



Dr. Bianca Chiara, MD, ABFM, IFMCP
Certified Functional Medicine Practitioner



“As a functional medicine MD I need data to provide individualized treatment plans. The ease of urine for home tracking of hormones daily with immediate data points is very gratifying and useful. In my case it allowed me to better understand what my ovaries are now doing after the trauma of surgery a few months ago and intervene where I can and know when not to intervene and not to use more estrogen for example.

Being able to follow hormones also helps me understand why I feel how I do and why it can change so much week to week.

I have been dismissed by multiple physicians in this process and this understanding gives them some peace of mind. Mira had made everything so much easier for me.”

Book a meeting with our clinical team



Scan the QR code or click
on [this link](#)

1. Meet with our clinical team

Scan the QR code to meet with our team, to learn how to use Mira with your patients and to arrange your trial

2. Trial a sample

Experience Mira yourself or with a patient.

3. Become a partner

Offer discounted Mira products to your patients.

Thank you!



1. Providers interested in Mira

Meet with our team to learn how to use Mira with your patients.



Scan the QR code or click [here](#)



References

Slide 1 — References

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References Continued

Slide 3 References

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Slide 4 References

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Appendix

