Case report: Extraordinary clinical response to ibrutinib in low-grade ovarian cancer guided by organoid drug testing

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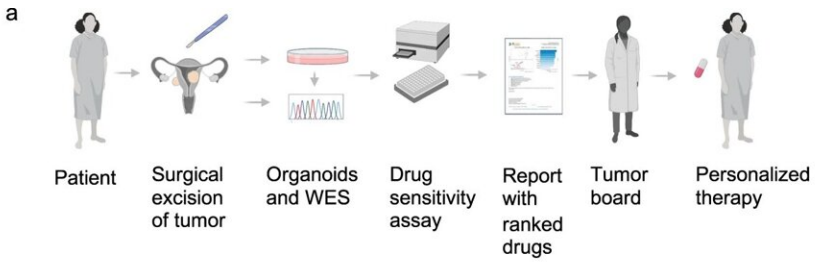
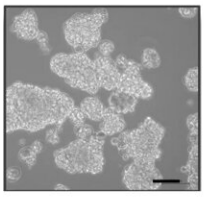


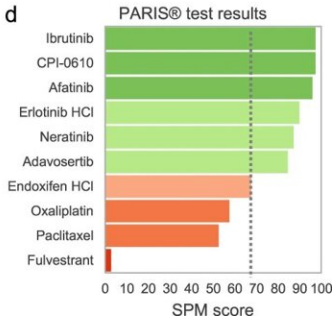
b



c

Gene	FO CDX Tumor mutations	VAF	Organoid mutations	VAF
CHEK2	T367fs*15	>0.05	T367fs*15	0.80
AKT1	D221E (VUS)	>0.05	D221E (VUS)	0.06
IRS2	A701_V702insA (VUS)	>0.05	A701_V702insA (VUS)	0.18
MSH3	L911W (VUS)	>0.05	L911W (VUS)	0.49
MUTYH	G162V (VUS)	>0.05	G162V (VUS)	0.41
NOTCH3	S663F (VUS)	>0.05	S663F (VUS)	0.54
MLL2/KMT2D	P2210L (VUS)	>0.05	P2210L(VUS)	0.45

d



PARIS assay workflow including organoid generation from the fresh surgical specimen, genomic characterization, and report generation. **a** Schematic of the clinical integration of the PARIS drug sensitivity assay. WES: whole exome sequencing. Created with BioRender.com. **b** Brightfield photomicrograph of the patient's cultured tumor organoids. Scale bar = 50 μm. **c** Mutational landscape of the primary tumor from Foundation One and all confirmed in tumor-derived organoids. The Foundation One (FO) report only reported mutations with >0.05 variant allele frequency (VAF) but did not report the actual value for each gene. ND not detected. **d** Table of top-scoring drugs in green from the PARIS assay. In red are classes of drugs that the patient took prior to the PARIS test. The results indicating oxaliplatin, taxanes, and ER targeting drugs showed no to borderline

(dotted line) sensitivity. Credit: *npj Precision Oncology* (2023). DOI: 10.1038/s41698-023-00379-8

Researchers associated with SEngine Precision Medicine, a precision oncology company that matches patients to medicines based on their own tumor samples, have published a new case report showing a patient's remarkable response to an off-label therapy identified by its PARIS Test.

Despite standard-of-care chemotherapy and two surgeries, the patient's low-grade serous ovarian cancer (LGSOC) was progressing and her prognosis was terminal. But by testing a range of therapies in organoids grown from the patient's own tumor sample, SEngine's PARIS Test identified as a top candidate ibrutinib, a BTK inhibitor approved only for certain leukemias and lymphomas and with no prior clinical evidence of efficacy in ovarian cancer.

Ibrutinib monotherapy led to cessation of opioid-based pain management, the patient's exit from hospice care, and 15 months of stable disease.

The PARIS Test, a unique Clinical Laboratory Improvement Amendments (CLIA)-certified drug sensitivity assay, consists of 3D organoids derived from a patient's tumor. Because no two cancers are identical, SEngine screens an array of drugs from a library of 240 small molecule drugs in the organoids, and develops a personalized report that scores therapies to maximize efficacy and minimize toxicity.

The patient has since continued treatment with two additional PARIS Test-prioritized therapies that are approved only for certain lung cancers. In total, her personalized treatment course has led to over two years of

stable disease, compared with a median progression-free survival of 7.2 months for patients with recurrent LGSOC. The paper was published in *npj Precision Oncology*, by researchers from SEngine, University of Washington, and Fred Hutchinson Cancer Center.

"We have been overjoyed by the progress this patient has made over more than two years following a treatment course recommended by the PARIS Test," said Dr. Carla Grandori, CEO of SEngine. "We first received a sample of her tumor following an unsuccessful surgery to remove a gastrointestinal obstruction, at a time when she was unable to eat and in hospice care. Her remarkable turnaround reaffirms the power of our approach, and further, helped us identify a cohort of ovarian cancer patients likely to respond to similar precision treatments."

More information: Heidi J. Gray et al, Extraordinary clinical response to ibrutinib in low-grade ovarian cancer guided by organoid drug testing, *npj Precision Oncology* (2023). DOI: 10.1038/s41698-023-00379-8

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