Supplementary Table S1. Information of all patients included in the study.

Sample Number	Diagnosis	Oncocytic	Class	Gender	AOD	Recurrent (R) / Non-recurrent (NR)	primary/meta	% tumor cells	necrosis	Molecular genetic typing	w-CIN	gain/loss imbalance	Prediction score	Classification	Inhibitor testing
Th-13	FA		benign	F	71	NA	primary	80		NFNV			0.040		
Th-29	FA		benign	M	46	NA	primary	50		NFNV			-0.442	FALSE	
Th-31	FA		benign	M	57	NA	primary	70		NFNV			0.993		
Th-32	FA		benign	F	6	NA	primary	60		NFNV			0.167		
Th-35	OA	O	benign	F	37	NA	primary	60		NRAS		loss chr 22	-0.103	FALSE	
Th-54	OA	O	benign	F	64	NA	primary	50		NFNV	*	R	0.010		
Th-55	OA	O	benign	F	61	NA	primary	50		NFNV	*	R	-0.272	FALSE	
Th-10	HP		benign	F	72	NA	primary			ND			0.886		
Th-16	HP		benign	M	61	NA	primary			ND			0.708		
Th-18	HP		benign	M	51	NA	primary			ND			1.212		
Th-21	HP		benign	F	56	NA	primary			NFNV			0.348		
Th-26	HP		benign	F	63	NA	primary			ND			0.803		
Th-34	HP		benign	F	55	NA	primary			NFNV			0.431		
Th-36	HP		benign	F	62	NA	primary			ND			0.372		
Th-4	HP		benign	F	62	NA	primary			NFNV			0.143		
Th-5	HP		benign	M	77	NA	primary			NFNV			0.682		
Th-57	HP		benign	M	13	NA	primary			NFNV			0.576		
Th-9	HP		benign	F	56	NA	primary			ND			1.326		
Th-22	HP (Graves)		benign	F	54	NA	primary			ND			-0.143	FALSE	
Th-46	HP (Graves)		benign	F	48	NR	primary			NFNV			-0.121	FALSE	
Th-7	HP (Graves)		benign	F	59	NA	primary			ND			0.132		
Th-1	ATC		malignant	F	87	R	meta	100		NFNV			-0.441		
Th-2	ATC		malignant	M	43	R	primary	70		IDH1			-0.666		
Th-24	ATC		malignant	M	73	R	primary	60		HRAS			-0.209		
Th-39	ATC		malignant	F	57	R	primary	30	n	NRAS			-0.714		
Th-43	ATC		malignant	F	64	R	primary	30	n	BRAF V600E			-1.008		
Th-47	ATC		malignant	M	69	R	primary	30	n	HSPA8 (e9) - MET (i3-e4)			0.203	FALSE	

ID	Type			Sex	Age					Mutation			Value		
Th-49	ATC		malignant	M	66	R	primary	40		NFNV			-0.736		
Th-6	ATC		malignant	F	79	R	meta	50	n	BRAF V600E			0.121	FALSE	
Th-3	ATC	O	malignant	M	43	R	primary	80		IDH1, AQP4 (e1) - RAF1 (i8-e9), FGFR3 (e17-i17) - LCN2 (e7)	*	loss (NHG)	-0.499		
Th-51	ATC	O	malignant	F	59	R	primary	80		NFNV	*	loss (NHG)	0.331	FALSE	
Th-27	FTC		malignant	M	79	R	primary	80		NFNV			-0.561		
Th-44	FTC		malignant	F	75	R	meta	30	n	NFNV			0.0963	FALSE	
Th-45	FTC		malignant	M	74	NR	primary	70		NFNV			-0.543		
Th-48	FTC		malignant	F	36	R	primary	60		NRAS			1.005	FALSE	
Th-50	FVPTC		malignant	M	16	NR	primary	70		NFNV			-0.840		X
Th-52	FVPTC		malignant	M	47	R	primary	80		NRAS, IDH2			-0.420		X
Th-53	FVPTC		malignant	M	39	NR	primary	70		NFNV			-0.444		X
Th-41	OCA	O	malignant	M	66	R	primary	60		NFNV	*	loss (NHG)	0.519	FALSE	
Th-42	OCA	O	malignant	M	59	R	primary	30		NFNV	*	loss (NHG)	0.120	FALSE	
Th-23	OCA (+ ATC)	O	malignant	F	69	UK	primary	20		NFNV			-0.464		
Th-40	OCA-MI	O	malignant	F	78	NR	primary	50		NFNV	*	imbalance	-0.239		
Th-56	OCA-MI	O	malignant	F	78	NR	primary	70		NFNV			-0.162		
Th-11	PTC		malignant	M	80	R	meta	60		NFNV			0.883	FALSE	X
Th-12	PTC		malignant	F	42	R	meta	60		NFNV			-0.457		X
Th-14	PTC		malignant	M	76	R	meta	70		BRAF V600E			-0.889		
Th-15	PTC		malignant	F	56	NR	meta	60		BRAF V600E			-0.299		X
Th-17	PTC		malignant	M	45	NR	meta	80		BRAF V600E			-0.070		X
Th-19	PTC		malignant	F	21	NR	primary	50		NFNV			-0.335		
Th-25	PTC		malignant	M	79	NR	meta	50		BRAF V600E			-0.855		X
Th-28	PTC		malignant	F	34	R	meta	20		BRAF V600E			-0.084		X
Th-30	PTC		malignant	F	24	NR	primary	50		BRAF V600E			-0.517		X
Th-37	PTC		malignant	M	67	R	LN meta	50		BRAF V600E			-1.160		X
Th-38	PTC		malignant	F	18	NR	primary	50		BRAF V600E			-1.190		X
Th-8	PTC		malignant	F	54	R	meta	50		CCDC6 (e1) - RET (e12), TERTc.-124 C>T			-1.136		X

ID	Type		Diagnosis	Sex	Age					Mutation			Value		
Th-49	ATC		malignant	M	66	R	primary	40		NFNV			-0.736		
Th-6	ATC		malignant	F	79	R	meta	50	n	BRAF V600E			0.121	FALSE	
Th-3	ATC	O	malignant	M	43	R	primary	80		IDH1, AQP4 (e1) - RAF1 (i8-e9), FGFR3 (e17-i17) - LCN2 (e7)	*	loss (NHG)	-0.499		
Th-51	ATC	O	malignant	F	59	R	primary	80		NFNV	*	loss (NHG)	0.331	FALSE	
Th-27	FTC		malignant	M	79	R	primary	80		NFNV			-0.561		
Th-44	FTC		malignant	F	75	R	meta	30	n	NFNV			0.0963	FALSE	
Th-45	FTC		malignant	M	74	NR	primary	70		NFNV			-0.543		
Th-48	FTC		malignant	F	36	R	primary	60		NRAS			1.005	FALSE	
Th-50	FVPTC		malignant	M	16	NR	primary	70		NFNV			-0.840		X
Th-52	FVPTC		malignant	M	47	R	primary	80		NRAS, IDH2			-0.420		X
Th-53	FVPTC		malignant	M	39	NR	primary	70		NFNV			-0.444		X
Th-41	OCA	O	malignant	M	66	R	primary	60		NFNV	*	loss (NHG)	0.519	FALSE	
Th-42	OCA	O	malignant	M	59	R	primary	30		NFNV	*	loss (NHG)	0.120	FALSE	
Th-23	OCA (+ ATC)	O	malignant	F	69	UK	primary	20		NFNV			-0.464		
Th-40	OCA-MI	O	malignant	F	78	NR	primary	50		NFNV	*	imbalance	-0.239		
Th-56	OCA-MI	O	malignant	F	78	NR	primary	70		NFNV			-0.162		
Th-11	PTC		malignant	M	80	R	meta	60		NFNV			0.883	FALSE	X
Th-12	PTC		malignant	F	42	R	meta	60		NFNV			-0.457		X
Th-14	PTC		malignant	M	76	R	meta	70		BRAF V600E			-0.889		
Th-15	PTC		malignant	F	56	NR	meta	60		BRAF V600E			-0.299		X
Th-17	PTC		malignant	M	45	NR	meta	80		BRAF V600E			-0.070		X
Th-19	PTC		malignant	F	21	NR	primary	50		NFNV			-0.335		
Th-25	PTC		malignant	M	79	NR	meta	50		BRAF V600E			-0.855		X
Th-28	PTC		malignant	F	34	R	meta	20		BRAF V600E			-0.084		X
Th-30	PTC		malignant	F	24	NR	primary	50		BRAF V600E			-0.517		X
Th-37	PTC		malignant	M	67	R	LN meta	50		BRAF V600E			-1.160		X
Th-38	PTC		malignant	F	18	NR	primary	50		BRAF V600E			-1.190		X
Th-8	PTC		malignant	F	54	R	meta	50		CCDC6 (e1) - RET (e12), TERTc.-124 C>T			-1.136		X

Supplementary Table S2. *p*-Values of the median serine/threonine kinase activity.

p-Values

	FA	OA	HP	ATC	FTC	OCA	PTC
FA		0.125	0.274	0.235	0.932	0.092	0.156
OA			0.061	0.698	0.245	0.9	0.976
HP				**0.008**	0.255	**0.021**	**0.001**
ATC					0.308	0.694	0.633
FTC						0.199	0.178
OCA							0.967
PTC							