

Table S1. The allele frequency of all nonsynonymous mutations identified in tumor tissue before receiving immunotherapy

Chr	Pos	Gene	Ref	Alt	T_DNA_DP	T_DNA_freq	T_RNA_DP	T_RNA_freq
chr1	153751670	SLC27A3	A	G	125	0.16	401	0.47
chr1	225700405	ENAH	G	A	97	0.20	164	0.16
chr1	234519474	COA6	A	C	37	0.30	436	0.27
chr12	25398284	KRAS	C	T	146	0.25	41	0.56
chr2	32734930	BIRC6	C	A	168	0.15	16	0
chr13	37016372	CCNA1	T	G	89	0.15	88	0.43
chr16	18826602	SMG1	T	A	96	0.17	46	0.13
chr17	45451923	EFCAB13	G	C	91	0.14	49	0.41
chr19	42907156	LIPE	G	T	134	0.13	40	0.18
chr5	54558630	DHX29	A	T	140	0.18	226	0.26
chr5	7878221	MTRR	C	G	164	0.18	152	0.30
chr7	154753273	PAXIP1	T	C	98	0.16	67	0.13
chr11	6643629	DCHS1	C	T	182	0.16	164	0.02
chr7	77256204	PTPN12	C	G	65	0.15	883	0.19
chrX	149828881	MTM1	T	G	54	0.17	49	0.45
chr12	46321953	SCAF11	T	G	153	0.20	13	0
chr15	74588226	CCDC33	G	C	149	0.16	19	0
chr15	81627272	TMC3	C	T	174	0.17	0	0
chr19	12460922	ZNF442	A	G	196	0.16	8	0
chr19	32945860	DPY19L3	G	A	28	0.21	1	0
chr15	28627558	GOLGA8G	A	T	46	0.15	47	0.01
chr8	145772864	ARHGAP39	C	T	163	0.07	53	0.57
chr19	10461599	TYK2	G	A	161	0.09	777	0.19
chr15	101114306	LINS1	G	A	117	0.07	29	0.10
chr2	127806181	BIN1	T	C	69	0.01	487	0.00
chr17	1943089	DPH1	A	T	171	0.02	436	0.00
chr1	89322996	GTF2B	C	T	88	0.03	196	0.00
chr7	99032808	PTCD1	T	G	199	0.01	132	0.00
chr22	43529282	MCAT	T	G	160	0.01	129	0.00
chr6	36449422	KCTD20	G	A	142	0.02	75	0.00
chr14	20846367	TEP1	C	T	139	0.01	70	0.00
chr16	89925616	SPIRE2	G	A	122	0.02	69	0.00
chr12	132335712	MMP17	T	C	168	0.01	58	0.00
chr11	64514213	PYGM	C	T	135	0.02	58	0.00
chr16	69149116	HAS3	C	G	136	0.01	43	0.00
chr6	157100442	ARID1B	C	G	70	0.07	26	0.00
chr7	2749338	AMZ1	T	C	137	0.01	9	0.00
chr2	215852470	ABCA12	A	T	113	0.02	6	0.00
chr5	101735303	SLCO6A1	T	C	92	0.08	5	0.00
chr17	47302392	PHOSPHO1	G	C	123	0.02	4	0.00
chr9	118982295	PAPPA	G	C	119	0.02	2	0.00

chr4	36309923	DTHD1	A	G	154	0.02	2	0.00
chr18	72020503	C18orf63	A	G	93	0.02	2	0.00
chr7	107703325	LAMB4	A	T	136	0.03	2	0.00
chr12	96970369	CFAP54	T	C	95	0.05	1	0.00
chr19	43376049	PSG1	C	G	234	0.02	0	0.00
chr19	5456031	ZNRF4	C	T	219	0.07	0	0.00
chr19	56370503	NLRP4	G	A	119	0.09	0	0.00

Table S2. The allele frequency of all indels identified in tumor tissue before receiving immunotherapy

Chr	Start	End	Ref	Alt	Genes	DNA_DP (tumor)	DNA_VAF (tumor)	RNA_DP (tumor)	RNA_VAF (tumor)
chr1	26189484	26189484	C	-	PAQR7	51	0.20	116	0.47
chr1	109823758	109823761	CTGG	-	PSRC1	189	0.19	0	0
chr4	106190884	106190885	AT	-	TET2	107	0.19	3	0.67
chr12	46321956	46321962	CACTTTC	-	SCAF11	207	0.23	0	0
chr17	38925190	38925191	TA	-	KRT26	69	0.12	0	0
chr19	18375458	18375471	GGTGAGTTCGCCC	-	KIAA1683	320	0.15	0	0
chrX	83127914	83127916	AGA	-	CYLC1	57	0.30	0	0

Table S3. The allele frequency of 8 non-neoantigen mutations pre- and post-immunotherapy

SNP_ID	Gene	Pre-immunotherapy_VAF	Post-immunotherapy_VAF
chr19_12460922	ZNF442	0.22033	0.133623
chr11_6643629	DCHS1	0.159340659	0.1432007
chr15_81627272	TMC3	0.166666667	0.123376623
chr2_32734930	BIRC6	0.154761905	0.179856115
chr15_74588226	CCDC33	0.161073826	0.157024793
chr12_46321953	SCAF11	0.202614379	0.166666667
chr15_28627558	GOLGA8F	0.152173913	0.085714286
chr19_32945860	DPY19L3	0.214285714	0.290322581

Table S4. Personalized neoantigen peptides and predicted HLA binding using MHCpan

ID	Mutation	Gene	MHC I	MHC II
chr13_37016372	L426R	CCNA1	HLA-DRB1*12:02	HLA-DRB1*12:02,HLA-DRB1*09:01
chr1_234519474	K50N	COA6	HLA-DRB1*12:02	HLA-DRB1*12:02
chr5_54558630	V1219E	DHX29	HLA-A*02:03	HLA-DRB1*12:02,HLA-DRB1*09:01
chr17_45451923	K321N	EFCAB1	HLA-A*02:03,HLA-A*11:01	,HLA-DRB1*12:02,HLA-DRB1*09:01
		3		
chr1_225700405	A706V	ENAH	HLA-A*02:03,HLA-C*03:04	HLA-DRB1*12:02,HLA-DRB1*09:01
chr12_25398284	G12D	KRAS	HLA-A*02:03,HLA-A*11:01	HLA-DRB1*12:02,HLA-DRB1*09:01
chr19_42907156	A857E	LIPE		HLA-DRB1*12:02
chrX_14982888	I464S	MTM1	HLA-A*02:03,HLA-B*13:01	HLA-DRB1*12:02,HLA-DRB1*09:01
		1		
chr5_7878221	S216C	MTRR	HLA-DRB1*12:02	HLA-DRB1*12:02
chr7_154753273	Y738C	PAXIP1	HLA-DRB1*12:02	HLA-DRB1*12:02,HLA-DRB1*09:01
chr7_77256204	A403G	PTPN12		HLA-DRB1*12:02
chr1_153751670	Y704C	SLC27A3	HLA-A*02:03	HLA-DRB1*12:02,HLA-DRB1*09:01
chr16_18826602	I3507F	SMG1	HLA-A*02:03,HLA-B*13:01	,HLA-DRB1*12:02,HLA-DRB1*09:01

Table S5. The expression of HLA subtypes in pre- and post-immunotherapy CDC biopsies

HLA subtypes	Expression in pre-immunotherapy CDC biopsy	Expression in post-immunotherapy CDC biopsy	status
HLA-A	1183.84	1409.57	↑
HLA-B	3345.41	3809.45	↑
HLA-C	436.81	629.64	↑
HLA-DRB1	174.78	203.25	↑
HLA-V	12.47	7.22	↓
HLA-U	6.08	0	↓
HLA-K	9.03	7.02	↓
HLA-J	9.53	6.2	↓
HLA-H	21.44	20.58	↓
HLA-F	219.36	196.73	↓
HLA-E	465.76	393.98	↓
HLA-DRB6	3.27	4.87	↑
HLA-DRB5	7.81	9.22	↑
HLA-DRA	1035.89	930	↓
HLA-DQB2	8.5	11.19	↑
HLA-DQB1	63.86	68.53	↑
HLA-DQA2	32.37	30.2	↓
HLA-DQA1	33.92	26.48	↓
HLA-DPB1	241.79	237.18	↓
HLA-DPA1	215.53	186.82	↓
HLA-DOB	9.59	2.8	↓
HLA-DOA	31.55	21	↓
HLA-DMB	94.78	89.97	↓
HLA-DMA	130.05	134.67	↑