



Research article

Identification of prognostic hypoxia-related genes signature on the tumor microenvironment in esophageal cancer

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Supplementary

Table S1. GSEA enrichment in high hypoxia risk groups of esophageal adenocarcinoma.

NAME	SIZ E	ES	NES	NOM p- val	FDR q- val	FWER p- val
HALLMARK_TNFA_SIGNALING_VIA_NFKB	199	0.5811	1.7299	0.05091	0.44963	0.192
	63		32	6	1	
HALLMARK_EPITHELIAL_MESENCHYMAL_TRANSITION	198	0.6115	1.7060	0.05285	0.26656	0.217
	09		83	4	3	
HALLMARK_ANGIOGENESIS	36	0.6031	1.6946	0.01443	0.19235	0.229
	5		35	3	8	
HALLMARK_INFLAMMATORY_RESPONSE	200	0.5501	1.6645	0.04752	0.18034	0.262
	86		85	1	2	
HALLMARK_UV_RESPONSE_DN	142	0.4669	1.6031	0.04918	0.21189	0.344
	47		29		5	
HALLMARK_HYPOXIA	197	0.4321	1.5832	0.03478	0.20103	0.376
	09		51	3	9	
HALLMARK_IL6_JAK_STAT3_SIGNALING	87	0.5257	1.5232	0.092	0.24248	0.465
	89		74		9	

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NAME	SIZ E	ES	NES	NOM p- val	FDR q- val	FWER p- val
HALLMARK_APOPTOSIS	160	0.3934 78	1.4799 06	0.04888	0.26095 6	0.513
HALLMARK_KRAS_SIGNALING_UP	199	0.3297 63	1.2086 07	0.22857 1	0.72464 3	0.857
HALLMARK_COMPLEMENT	200	0.3317 09	1.1894 09	0.24329 9	0.70388 8	0.878
HALLMARK_TGF_BETA_SIGNALING	54	0.3718 35	1.1847 14	0.27897 8	0.65152 4	0.881
HALLMARK_INTERFERON_GAMMA_RESPON SE	198	0.4308 56	1.1777 95	0.31062 1	0.61365 2	0.89
HALLMARK_HEDGEHOG_SIGNALING	36	0.3787 45	1.1729 23	0.26229 5	0.57698 7	0.895
HALLMARK_MITOTIC_SPINDLE	198	0.3250 11	1.1621 24	0.28488 4	0.55643 2	0.901
HALLMARK_G2M_CHECKPOINT	196	0.3860 82	1.1562 39	0.33270 7	0.52835 9	0.905
HALLMARK_ALLOGRAFT_REJECTION	196	0.4209 28	1.1541 95	0.35039 4	0.49925 7	0.907
HALLMARK_IL2_STAT5_SIGNALING	199	0.3135 2	1.1345 06	0.29697	0.50515 9	0.922
HALLMARK_ANDROGEN_RESPONSE	99	0.2870 61	1.0969 85	0.29182 9	0.53872 1	0.942
HALLMARK_MYOGENESIS	199	0.2860 23	1.0320 05	0.41327 6	0.62300 1	0.966
HALLMARK_E2F_TARGETS	198	0.3625 46	0.9939 03	0.45730 6	0.66540 9	0.978
HALLMARK_APICAL_JUNCTION	200	0.2677 17	0.9872 62	0.45877 4	0.64635 7	0.98
HALLMARK_INTERFERON_ALPHA_RESPON SE	96	0.3720 85	0.9509 39	0.51888 7	0.68109 6	0.984
HALLMARK_GLYCOLYSIS	198	0.2467 29	0.9395 28	0.51619 4	0.67260 4	0.987
HALLMARK_NOTCH_SIGNALING	32	0.2727 8	0.9167 54	0.55882 4	0.68290 8	0.989
HALLMARK_SPERMATOGENESIS	133	0.2485 74	0.9063 89	0.57058 8	0.67140 3	0.991
HALLMARK_PROTEIN_SECRETION	96	0.2660 23	0.8946 94	0.56707 3	0.66510 4	0.992

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NAME	SIZ E	ES	NES	NOM p- val	FDR q- val	FWER p- val
HALLMARK_APICAL_SURFACE	44	0.2674 1	0.8545 57	0.6625	0.70995 2	0.997
HALLMARK_MTORC1_SIGNALING	197	0.2377 94	0.8230 29	0.64932 6	0.73711 8	0.997
HALLMARK_COAGULATION	138	0.2189 3	0.7582 09	0.79	0.81445 6	0.998
HALLMARK_UNFOLDED_PROTEIN_RESPON SE	110	0.1983 98	0.6824 95	0.868	0.89641 1	0.999
HALLMARK_MYC_TARGETS_V1	196	0.2394 67	0.6492 21	0.75241 8	0.90791	0.999
HALLMARK_MYC_TARGETS_V2	58	0.2588 04	0.6419 94	0.76693 2	0.88635 9	0.999

Table S2. GSEA enrichment in low hypoxia risk groups of esophageal adenocarcinoma.

NAME	SIZ E	ES	NES	NOM p-val	FDR q- val	FWE R p- val
HALLMARK_FATTY_ACID_METABOLISM	157	- 0.4728	- 1.7360	0.01018 3	0.19740 5	0.163
HALLMARK_XENOBIOTIC_METABOLISM	198	- 0.4351	- 1.7186	0.002 9	0.11480	0.184
HALLMARK_OXIDATIVE_PHOSPHORYLATION	200	- 0.5486	- 1.6224	0.07362 9	0.16112	0.323
HALLMARK_PEROXISOME	104	- 0.4142	- 1.5351	0.02429 1	0.20192 8	0.439
HALLMARK_ADIPOGENESIS	198	- 0.3674	- 1.4335	0.07231 4	0.28588 9	0.598
HALLMARK_BILE_ACID_METABOLISM	112	- 0.3816	-1.388 8	0.07385 2	0.29722 7	0.662
HALLMARK_ESTROGEN_RESPONSE_LATE	197	- 0.3310	- 1.3514	0.08167 3	0.30120 3	0.71

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NAME	SIZ E	ES	NES	NOM p-val	FDR q- val	FWE R p- val
HALLMARK_CHOLESTEROL_HOMEOSTASIS	73	- 0.3904	- 1.3363 1	0.14583 3	0.28329 6	0.733
HALLMARK_KRAS_SIGNALING_DN	199	- 0.3170 1	- 1.1893 2	0.20381	0.44932 1	0.887
HALLMARK_PI3K_AKT_MTOR_SIGNALING	105	- 0.2832 4	- 1.1085 4	0.27888 4	0.53427 7	0.941
HALLMARK_UV_RESPONSE_UP	156	- 0.2636 9	- 1.0784 6	0.31488 6	0.53426 3	0.95
HALLMARK_P53_PATHWAY	196	- 0.2664 7	- 1.0609 5	0.37096 8	0.51546 9	0.955
HALLMARK_PANCREAS_BETA_CELLS	40	- 0.4187 3	- 1.0360 5	0.48327 1	0.51284 5	0.964
HALLMARK_WNT_BETA_CATENIN_SIGNALING	42	- 0.3257 7	- 1.0333 5	0.42299 8	0.48069 4	0.968
HALLMARK_ESTROGEN_RESPONSE_EARLY	198	- 0.2573 8	- 0.9855	0.46274 5	0.51264 8	0.976
HALLMARK_HEME_METABOLISM	195	- 0.2083 4	- 0.8680 5	0.69879 5	0.65854 5	0.99
HALLMARK_REACTIVE_OXYGEN_SPECIES_PATHWAY	49	- 0.2602 1	- 0.8652 4	0.64139 3	0.62418 9	0.99
HALLMARK_DNA_REPAIR	149	- 0.2332 9	- 0.7899 9	0.69795 9	0.69572 5	0.995

Table S3. GSEA enrichment in high hypoxia risk groups of esophageal squamous cell carcinoma.

NAME	ES	NES	NOM p- val	FDR q- val	FWER p-val
HALLMARK_REACTIVE_OXYGEN_SPECIES_PATHWAY	0.55530 5	1.60238 6	0.09109 3	0.42901 2	0.394
HALLMARK_OXIDATIVE_PHOSPHORYLATION	0.46329	1.32523	0.24444 4	0.68399 1	0.662
HALLMARK_XENOBIOTIC_METABOLISM	0.28818 2	1.13660 7	0.27091 6	0.87938 6	0.808
HALLMARK_P53_PATHWAY	0.27528 6	1.00203 8	0.47222 2	1	0.887
HALLMARK_FATTY_ACID_METABOLISM	0.26975 1	0.97535 1	0.48407 6	0.87735 5	0.899
HALLMARK_ADIPOGENESIS	0.24586 9	0.87414 5	0.59674 1	0.96216 3	0.946
HALLMARK_PEROXISOME	0.22834	0.86531	0.65738 8	0.84224 8	0.95
HALLMARK_BILE_ACID_METABOLISM	0.21041 7	0.85740 3	0.66252 6	0.75174 7	0.95
HALLMARK_ALLOGRAFT_REJECTION	0.22445 8	0.77689 1	0.67342 8	0.80059 5	0.968
HALLMARK_INTERFERON_GAMMA_RESPONSE	0.25377 7	0.75645 7	0.63016 5	0.74999 1	0.971
HALLMARK_INTERFERON_ALPHA_RESPONSE	0.26728 8	0.68582 5	0.71371	0.77174 7	0.982

Table S4. GSEA enrichment in low hypoxia risk groups of esophageal squamous cell carcinoma.

NAME	ES	NES	NOM p- val	FDR q- val	FWE R p- val
HALLMARK_MITOTIC_SPINDLE	- 0.6829 4	- 2.2783 9	0	0.00278	0.002
HALLMARK_WNT_BETA_CATENIN_SIGNALING	- 0.6701 6	- 2.1395 4	0	0.01515 2	0.019
HALLMARK_G2M_CHECKPOINT	- 0.6873	- 2.0998 6	0.00910 7	0.01393 6	0.025
HALLMARK_UV_RESPONSE_DN	- 0.6359	- 2.0476 7	0.00198	0.01809 1	0.042
HALLMARK_EPITHELIAL_MESENCHYMAL_TRANSITION	- 0.7217 5	- 2.0421 3	0.00998	0.01572 6	0.045
HALLMARK_TGF_BETA_SIGNALING	- 0.5668 3	- 1.8991 4	0.014	0.04845 4	0.14
HALLMARK_APICAL_JUNCTION	- 0.5425 5	- 1.8665 1	0	0.05139 7	0.164
HALLMARK_HEDGEHOG_SIGNALING	- 0.6017 4	- 1.8295 9	0.01002	0.05530 2	0.193
HALLMARK_ANGIOGENESIS	- 0.5878	- 1.7743 5	0.02316 6	0.06554 5	0.236
HALLMARK_E2F_TARGETS	- 0.6287 6	- 1.7607 7	0.06445 7	0.06302	0.248
HALLMARK_ANDROGEN_RESPONSE	- 0.4448 7	- 1.6503 4	0.01964 6	0.10346 7	0.364
HALLMARK_PROTEIN_SECRETION	- 0.4523 3	- 1.5815 3	0.05754	0.13701 2	0.44

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NAME	ES	NES	NOM p- val	FDR q- val	FWE R p- val
HALLMARK_NOTCH_SIGNALING	- 0.4738	- 1.5172 9	0.04263 6	0.17164 6	0.492
HALLMARK_APICAL_SURFACE	- 0.4006 6	- 1.4279 8	0.05686 3	0.23428 4	0.577
HALLMARK_SPERMATOGENESIS	- 0.3406	-1.418 9	0.05436 9	0.22881	0.587
HALLMARK_MYOGENESIS	- 0.4081 1	- 1.4078 3	0.15904 6	0.22390 7	0.601
HALLMARK_KRAS_SIGNALING_UP	- 0.3719 9	- 1.3909 6	0.12476 1	0.22570 1	0.622
HALLMARK_APOPTOSIS	- 0.3539 5	- 1.3824 9	0.07554 7	0.22075 8	0.631
HALLMARK_COAGULATION	- 0.3474 6	- 1.3577 1	0.13157 9	0.23144	0.651
HALLMARK_IL2_STAT5_SIGNALING	- 0.3319 5	- 1.2998 1	0.16602 3	0.27708 8	0.706
HALLMARK_ESTROGEN_RESPONSE_EARLY	- 0.3450 3	- 1.2789 9	0.17181 5	0.28671 6	0.725
HALLMARK_GLYCOLYSIS	- 0.3407 7	- 1.2373 9	0.19493 2	0.32134 8	0.764
HALLMARK_PI3K_AKT_MTOR_SIGNALING	-0.314	- 1.2136 6	0.18525 5	0.33266 1	0.775
HALLMARK_ESTROGEN_RESPONSE_LATE	- 0.3181 9	- 1.1695 4	0.21031 7	0.36848 4	0.802
HALLMARK_HYPOXIA	- 0.3087	- 1.0958	0.34268 5	0.44421 3	0.849
HALLMARK_MYC_TARGETS_V2	- 0.3966	- 1.0835	0.40319 4	0.44521 8	0.861

	9	4			
HALLMARK_HEME_METABOLISM	-	-	0.41386	0.50837	0.9
	0.2405	1.0282	1	4	
	8	3			
HALLMARK_IL6_JAK_STAT3_SIGNALING	-	-	0.41176	0.50361	0.903
	0.3101	1.0187	5	5	
	8	4			
HALLMARK_CHOLESTEROL_HOMEOSTASIS	-	-	0.44168	0.49240	0.907
	0.3060	1.0147	3	3	
	1	3			
HALLMARK_MTORC1_SIGNALING	-	-	0.44313	0.49190	0.909
	0.2912	1.0016	7	5	
	6	2			
HALLMARK_UNFOLDED_PROTEIN_RESPONSE	-	-	0.47117	0.48620	0.912
	0.2834	0.9938	3	8	
	9				
HALLMARK_COMPLEMENT	-	-	0.46845	0.49124	0.916
	0.2576	0.9785	1	1	
	3	5			
HALLMARK_KRAS_SIGNALING_DN	-	-	0.56032	0.54712	0.936
	0.2135	0.9280	7		
	7	6			
HALLMARK_TNFA_SIGNALING_VIA_NFKB	-	-	0.51143	0.53317	0.936
	0.2729	0.9261	5	5	
	5	6			
HALLMARK_PANCREAS_BETA_CELLS	-	-	0.60816	0.56409	0.948
	0.2571	0.8947	3	8	
	4	7			
HALLMARK_DNA_REPAIR	-	-	0.53470	0.56870	0.953
	0.2678	0.8817	9	4	
	9	7			
HALLMARK_INFLAMMATORY_RESPONSE	-	-	0.64566	0.64723	0.972
	0.2273	0.8180	9	7	
	2	3			
HALLMARK_UV_RESPONSE_UP	-	-	0.75595	0.63322	0.972
	0.2105	0.8158	2	3	
	1	8			
HALLMARK_MYC_TARGETS_V1	-	-	0.63723	0.68546	0.98
	0.2547	0.7641	6		
		8			