Single-gene prognostic signatures for advanced stage serous ovarian cancer based on 1257 patient samples

Fan Zhang[1,†], Kai Yang[1,†], Kui Deng[1], Yuanyuan Zhang[1], Weiwei Zhao[1], Huan Xu[1], Zhiwei Rong[1], Kang Li[1,*]

[1]Department of Biostatistics, Public Health School, Harbin Medical University, Harbin, 150086, P.R. China

*Corresponding author: Kang Li Email: likang@ems.hrbmu.edu.cn. Tel: 86-451-87502939. Fax: 86-451-87502831.

† These authors contributed equally to this work.

The process of principal component regression

Firstly, we conducted principal component analysis for 341 genes in EB dataset.

Secondly, the scores of principal components in each sample were calculated by multiplying loadings and gene expression values.

Thirdly, we conducted cox regression for different number of principal components. The third principal component was not statistically significant. So, we selected first 2 components.

R code for principal component regression in this study

```
data=read.csv("G:\\dataForPCR.csv")

data2=data[,4:ncol(data)]

#principle component analysis

pca<-prcomp(data2)

#The loadings of 341 genes in the first 2 components

loadings=pca$rotation[,1:2]

#cox regression for first 2 components

pc12=data.frame(pca$x[,1:2],status=data[,2],time=data[,3])

library(survival)

coxph(Surv(time, status)~PC1+PC2,data=pc12)
```

Supplementary Table S1. The detailed information of genes associated with OS in this study.

No.	Gene	P	FDR	C	HR(CI)
Positively OS-associated genes					
1	GMPR	1.27E-07	5.30E-04	-0.18	0.84(0.78-0.89)
2	ALDH5A1	5.71E-07	1.23E-03	-0.22	0.8(0.74-0.88)
3	PCK2	2.75E-06	3.27E-03	-0.29	0.75(0.66-0.84)
4	GJB1	4.04E-06	3.27E-03	-0.26	0.77(0.69-0.86)
5	DHRS4	4.38E-06	3.27E-03	-0.33	0.72(0.62-0.83)
6	SNRPA1	9.36E-06	4.24E-03	-0.25	0.78(0.7-0.87)
7	PRIM2	1.06E-05	4.24E-03	-0.29	0.75(0.65-0.85)
8	EMC9	1.80E-05	4.47E-03	-0.31	0.73(0.64-0.85)
9	STOML2	2.14E-05	4.47E-03	-0.25	0.78(0.69-0.87)
10	CAAP1	2.16E-05	6.38E-03	-0.23	0.79(0.71-0.88)
11	MCM5	2.57E-05	8.43E-03	-0.20	0.82(0.75-0.9)
12	PSME2P2	2.69E-05	8.43E-03	-0.26	0.77(0.69-0.87)
13	IL6R	2.87E-05	8.43E-03	-0.16	0.85(0.79-0.92)
14	PLAA	3.52E-05	1.78E-02	-0.29	0.75(0.66-0.86)
15	CD38	3.76E-05	1.78E-02	-0.21	0.81(0.73-0.89)
16	SLC37A4	4.54E-05	1.78E-02	-0.29	0.75(0.65-0.86)
17	CXCL11	5.08E-05	1.78E-02	-0.10	0.9(0.86-0.95)
18	POLD3	5.49E-05	1.78E-02	-0.29	0.75(0.65-0.86)
19	FOXJ1	5.94E-05	1.78E-02	-0.18	0.83(0.76-0.91)
20	OXLD1	6.78E-05	1.78E-02	-0.25	0.78(0.68-0.88)
21	TRIM27	8.83E-05	2.15E-02	-0.25	0.78(0.69-0.88)
22	CCL13	9.18E-05	2.15E-02	-0.32	0.72(0.62-0.85)
23	ZNF165	1.06E-04	2.15E-02	-0.20	0.82(0.74-0.91)
24	CYB561	1.11E-04	2.15E-02	-0.26	0.77(0.68-0.88)
25	CYBA	1.15E-04	2.15E-02	-0.19	0.83(0.76-0.91)
26	CNOT4	1.16E-04	2.15E-02	-0.28	0.75(0.65-0.87)
27	TESK1	1.22E-04	2.15E-02	-0.31	0.73(0.63-0.86)
28	ACOT13	1.25E-04	2.15E-02	-0.22	0.8(0.72-0.9)
29	SDF2L1	1.35E-04	2.15E-02	-0.20	0.82(0.74-0.91)
30	WDR77	1.36E-04	2.15E-02	-0.26	0.77(0.67-0.88)
31	SLC27A2	1.39E-04	2.15E-02	-0.30	0.74(0.63-0.86)
32	GSTZ1	1.43E-04	2.15E-02	-0.22	0.8(0.71-0.9)
33	FCHSD2	1.50E-04	2.15E-02	-0.25	0.78(0.68-0.88)
34	ST6GAL1	1.55E-04	2.15E-02	-0.15	0.86(0.79-0.93)
35	VCP	1.57E-04	2.36E-02	-0.22	0.8(0.72-0.9)
36	RMI1	1.86E-04	2.36E-02	-0.21	0.81(0.73-0.91)
37	FEN1	1.86E-04	2.36E-02	-0.20	0.82(0.74-0.91)
38	PRPS2	1.87E-04	2.36E-02	-0.18	0.84(0.76-0.92)
39	NFX1	2.03E-04	2.36E-02	-0.25	0.78(0.68-0.89)
40	GALNT6	2.13E-04	2.36E-02	-0.15	0.86(0.8-0.93)

41	RCL1	2.14E-04	2.36E-02	-0.29	0.74(0.64-0.87)
42	GCNT1	2.15E-04	2.36E-02	-0.26	0.77(0.67-0.89)
43	FN3KRP	2.16E-04	2.36E-02	-0.28	0.76(0.66-0.88)
44	SLC5A1	2.36E-04	2.36E-02	-0.16	0.86(0.79-0.93)
45	SPDEF	2.46E-04	2.36E-02	-0.16	0.85(0.78-0.93)
46	TRIM26	2.50E-04	2.36E-02	-0.29	0.75(0.64-0.88)
47	CHAF1B	2.55E-04	2.36E-02	-0.28	0.76(0.65-0.88)
48	CASP8AP2	2.57E-04	2.36E-02	-0.22	0.81(0.72-0.9)
49	PIR	2.58E-04	2.36E-02	-0.14	0.87(0.81-0.94)
50	GALNT12	2.64E-04	3.17E-02	-0.16	0.86(0.79-0.93)
51	POLA2	2.88E-04	3.17E-02	-0.29	0.75(0.64-0.88)
52	GZMB	2.91E-04	3.17E-02	-0.15	0.86(0.79-0.93)
53	MCM3	3.03E-04	3.17E-02	-0.19	0.82(0.74-0.92)
54	STXBP6	3.08E-04	3.17E-02	-0.10	0.91(0.86-0.96)
55	MCAT	3.13E-04	3.17E-02	-0.28	0.76(0.65-0.88)
56	C9orf116	3.20E-04	3.17E-02	-0.22	0.8(0.71-0.91)
57	SYK	3.21E-04	3.17E-02	-0.17	0.85(0.77-0.93)
58	BCAP31	3.35E-04	3.17E-02	-0.22	0.8(0.71-0.9)
59	COX7A2P2	3.40E-04	3.17E-02	-0.24	0.78(0.69-0.9)
60	BRCC3	3.40E-04	3.17E-02	-0.22	0.81(0.72-0.91)
61	SDR39U1	3.45E-04	3.17E-02	-0.26	0.77(0.67-0.89)
62	ZNHIT2	3.56E-04	3.17E-02	-0.31	0.73(0.62-0.87)
63	LRRK1	3.68E-04	3.17E-02	-0.27	0.76(0.66-0.89)
64	WDR3	3.89E-04	3.55E-02	-0.21	0.81(0.72-0.91)
65	SIRT5	4.00E-04	3.55E-02	-0.20	0.82(0.73-0.91)
66	COA4	4.00E-04	3.55E-02	-0.22	0.8(0.71-0.91)
67	EFTUD1	4.12E-04	3.55E-02	-0.26	0.77(0.66-0.89)
68	FAM86B2	4.26E-04	3.55E-02	-0.40	0.67(0.53-0.84)
69	WDR45B	4.44E-04	3.55E-02	-0.21	0.81(0.72-0.91)
70	CIB1	4.47E-04	3.55E-02	-0.20	0.82(0.74-0.92)
71	NT5C	4.55E-04	4.05E-02	-0.34	0.71(0.59-0.86)
72	ENDOG	4.60E-04	4.05E-02	-0.20	0.82(0.73-0.91)
73	UBD	4.96E-04	4.05E-02	-0.07	0.93(0.89-0.97)
74	POLG	4.98E-04	4.05E-02	-0.28	0.76(0.65-0.89)
75	FOCAD	5.05E-04	4.05E-02	-0.21	0.81(0.73-0.91)
76	AADAC	5.22E-04	4.05E-02	-0.13	0.88(0.81-0.94)
77	SLC25A1	5.42E-04	4.05E-02	-0.20	0.82(0.73-0.92)
78	WARS	5.51E-04	4.05E-02	-0.16	0.85(0.78-0.93)
79	SYNGR2	5.59E-04	4.05E-02	-0.18	0.83(0.75-0.92)
80	CREB3	5.79E-04	4.05E-02	-0.26	0.77(0.67-0.9)
81	GPRC5C	6.26E-04	4.05E-02	-0.15	0.86(0.79-0.94)
82	DNAJA1	6.28E-04	4.05E-02	-0.19	0.82(0.74-0.92)
83	LINC00338	6.40E-04	4.05E-02	-0.23	0.8(0.7-0.91)
84	MAK	6.67E-04	4.05E-02	-0.19	0.83(0.74-0.92)

85	TBCC	7.10E-04	4.05E-02	-0.25	0.78(0.68-0.9)
86	TAP2	7.29E-04	4.05E-02	-0.15	0.86(0.79-0.94)
87	KRT18P38	7.59E-04	4.05E-02	-0.53	0.59(0.43-0.8)
88	EFHC2	7.69E-04	4.05E-02	-0.14	0.87(0.8-0.94)
89	GMPR2	7.70E-04	4.05E-02	-0.21	0.81(0.72-0.92)
90	LRIF1	7.75E-04	4.37E-02	-0.21	0.81(0.72-0.92)
91	TIPIN	7.84E-04	4.37E-02	-0.22	0.8(0.71-0.91)
92	MRPS11	7.89E-04	4.37E-02	-0.24	0.79(0.69-0.91)
93	SLC7A11	8.18E-04	4.37E-02	-0.12	0.89(0.83-0.95)
94	SENP6	8.26E-04	4.37E-02	-0.20	0.82(0.73-0.92)
95	GCH1	8.33E-04	4.37E-02	-0.14	0.87(0.81-0.95)
96	SURF2	8.37E-04	4.37E-02	-0.30	0.74(0.62-0.88)
97	C6orf165	8.50E-04	4.37E-02	-0.20	0.82(0.72-0.92)
98	FAH	8.93E-04	4.37E-02	-0.14	0.87(0.8-0.94)
99	TDP2	8.99E-04	4.37E-02	-0.18	0.83(0.75-0.93)
100	MAGEF1	9.05E-04	4.37E-02	-0.21	0.81(0.72-0.92)
101	ZNF440	9.06E-04	4.37E-02	-0.26	0.77(0.66-0.9)
102	KIAA0020	9.19E-04	4.37E-02	-0.21	0.81(0.72-0.92)
103	TAP1	9.19E-04	4.37E-02	-0.11	0.9(0.84-0.96)
104	SDHAP3	9.20E-04	4.37E-02	-0.24	0.79(0.69-0.91)
105	FRYL	9.23E-04	4.37E-02	-0.23	0.79(0.69-0.91)
106	LRIG1	9.29E-04	4.37E-02	-0.11	0.89(0.84-0.96)
107	THOP1	9.37E-04	4.37E-02	-0.34	0.71(0.58-0.87)
108	HLA-DOB	9.52E-04	4.37E-02	-0.19	0.83(0.74-0.93)
109	NAT10	9.60E-04	4.37E-02	-0.23	0.79(0.69-0.91)
110	LPAR2	9.60E-04	4.37E-02	-0.24	0.79(0.68-0.91)
Negatively OS-associated genes					
1	HSPB7	1.08E-07	5.30E-04	0.54	1.71(1.41-2.09)
2	ASAP3	1.68E-07	8.69E-04	0.35	1.41(1.24-1.61)
3	AXL	2.60E-07	1.23E-03	0.26	1.3(1.17-1.43)
4	CILP	4.44E-07	1.23E-03	0.15	1.16(1.1-1.23)
5	MFAP4	6.52E-07	3.27E-03	0.17	1.19(1.11-1.27)
6	LRP1	1.07E-06	3.27E-03	0.35	1.42(1.23-1.63)
7	TMEM256-PLSCR3	1.60E-06	3.27E-03	0.35	1.42(1.23-1.63)
8	LUZP1	1.81E-06	3.27E-03	0.41	1.5(1.27-1.77)
9	RAB11FIP5	2.93E-06	3.27E-03	0.40	1.5(1.26-1.77)
10	ZFHX4	3.22E-06	3.27E-03	0.27	1.31(1.17-1.48)
11	EHD2	3.61E-06	3.27E-03	0.31	1.37(1.2-1.56)
12	HP1BP3	4.36E-06	3.27E-03	0.27	1.31(1.17-1.47)
13	LRRN3	4.46E-06	4.24E-03	0.33	1.39(1.21-1.6)
14	TMEM204	6.38E-06	4.24E-03	0.31	1.36(1.19-1.55)
15	MAL	6.41E-06	4.24E-03	0.09	1.09(1.05-1.13)
16	CRYAB	6.97E-06	4.24E-03	0.12	1.13(1.07-1.19)
17	SVIL	7.49E-06	4.24E-03	0.20	1.22(1.12-1.33)

18	COL16A1	7.50E-06	4.24E-03	0.18	1.19(1.1-1.29)
19	NUAK1	7.67E-06	4.24E-03	0.15	1.16(1.09-1.23)
20	JAM2	8.50E-06	4.24E-03	0.20	1.22(1.12-1.33)
21	GPR124	8.82E-06	4.24E-03	0.27	1.31(1.16-1.47)
22	ARNT	9.44E-06	4.24E-03	0.33	1.39(1.2-1.62)
23	GALNT10	9.62E-06	4.24E-03	0.23	1.26(1.14-1.39)
24	MINOS1-NBL1	1.02E-05	4.24E-03	0.17	1.19(1.1-1.29)
25	AKAP12	1.11E-05	4.24E-03	0.13	1.14(1.08-1.21)
26	PDGFD	1.16E-05	4.24E-03	0.15	1.16(1.08-1.24)
27	LRRC17	1.16E-05	4.47E-03	0.13	1.14(1.07-1.2)
28	PDGFRB	1.29E-05	4.47E-03	0.25	1.28(1.14-1.43)
29	GLT8D2	1.30E-05	4.47E-03	0.18	1.2(1.1-1.3)
30	PTPRD	1.38E-05	4.47E-03	0.20	1.22(1.12-1.34)
31	ZEB1	1.54E-05	4.47E-03	0.16	1.17(1.09-1.26)
32	ID3	1.56E-05	4.47E-03	0.17	1.19(1.1-1.29)
33	PDPN	1.71E-05	4.47E-03	0.16	1.18(1.09-1.27)
34	VAT1	1.77E-05	4.47E-03	0.32	1.38(1.19-1.59)
35	SV2A	1.80E-05	4.47E-03	0.23	1.26(1.13-1.4)
36	C1QTNF3	1.81E-05	4.47E-03	0.15	1.16(1.09-1.24)
37	MXRA8	1.86E-05	4.47E-03	0.16	1.18(1.09-1.27)
38	ZCCHC24	1.93E-05	4.47E-03	0.21	1.23(1.12-1.36)
39	DCHS1	1.98E-05	4.47E-03	0.18	1.2(1.1-1.31)
40	TUBB6	2.02E-05	4.47E-03	0.17	1.19(1.1-1.28)
41	COPZ2	2.05E-05	4.47E-03	0.21	1.24(1.12-1.37)
42	TIMP3	2.05E-05	4.47E-03	0.12	1.13(1.07-1.19)
43	FZD1	2.08E-05	4.47E-03	0.20	1.22(1.11-1.34)
44	GFPT2	2.09E-05	4.47E-03	0.22	1.24(1.12-1.37)
45	SYDE1	2.14E-05	4.47E-03	0.37	1.44(1.22-1.71)
46	HSD17B6	2.24E-05	6.38E-03	0.22	1.25(1.13-1.39)
47	SH3PXD2A	2.29E-05	8.43E-03	0.30	1.35(1.18-1.56)
48	MPRIP	2.66E-05	8.43E-03	0.32	1.37(1.18-1.59)
49	IGF2	2.75E-05	8.43E-03	0.06	1.06(1.03-1.09)
50	RHOBTB3	2.92E-05	8.43E-03	0.14	1.15(1.08-1.22)
51	ECM2	2.92E-05	1.24E-02	0.15	1.16(1.08-1.24)
52	MAGEL2	3.05E-05	1.78E-02	0.31	1.36(1.18-1.57)
53	HSPB6	3.42E-05	1.78E-02	0.23	1.26(1.13-1.41)
54	ENOX1	3.93E-05	1.78E-02	0.32	1.38(1.18-1.61)
55	CD302	4.17E-05	1.78E-02	0.17	1.18(1.09-1.28)
56	N4BP2L2	5.02E-05	1.78E-02	0.24	1.27(1.13-1.42)
57	FXYD5	5.73E-05	1.78E-02	0.18	1.2(1.1-1.31)
58	FOXN3	6.04E-05	1.78E-02	0.25	1.28(1.14-1.45)
59	COL5A1	6.06E-05	1.78E-02	0.10	1.1(1.05-1.16)
60	KIF26B	6.18E-05	1.78E-02	0.20	1.22(1.11-1.35)
61	ITSN1	6.36E-05	1.78E-02	0.32	1.37(1.18-1.6)

62	SORBS1	6.36E-05	1.78E-02	0.21	1.24(1.11-1.37)
63	FGF1	6.46E-05	1.78E-02	0.29	1.33(1.16-1.54)
64	SLIT3	6.49E-05	1.78E-02	0.21	1.23(1.11-1.36)
65	AP3S1	6.81E-05	2.15E-02	0.30	1.35(1.16-1.56)
66	HIGD1B	7.58E-05	2.15E-02	0.47	1.6(1.27-2.01)
67	APOD	7.86E-05	2.15E-02	0.17	1.18(1.09-1.28)
68	TMEM158	8.08E-05	2.15E-02	0.11	1.12(1.06-1.18)
69	MUL1	8.31E-05	2.15E-02	0.44	1.55(1.25-1.93)
70	LEFTY2	8.38E-05	2.15E-02	0.23	1.26(1.12-1.41)
71	SACS	8.97E-05	2.15E-02	0.21	1.24(1.11-1.38)
72	FSTL3	9.02E-05	2.15E-02	0.36	1.44(1.2-1.72)
73	PPP1R13L	1.01E-04	2.15E-02	0.23	1.26(1.12-1.41)
74	WBP1L	1.10E-04	2.15E-02	0.25	1.28(1.13-1.45)
75	ANGPTL2	1.12E-04	2.15E-02	0.19	1.21(1.1-1.33)
76	CLIP3	1.13E-04	2.15E-02	0.18	1.2(1.09-1.31)
77	CYTH3	1.14E-04	2.15E-02	0.36	1.44(1.19-1.73)
78	ESD	1.20E-04	2.15E-02	0.25	1.28(1.13-1.45)
79	PLXDC1	1.21E-04	2.15E-02	0.20	1.22(1.1-1.36)
80	CYBRD1	1.27E-04	2.15E-02	0.13	1.14(1.07-1.22)
81	LMCD1	1.38E-04	2.15E-02	0.18	1.2(1.09-1.32)
82	PAK4	1.40E-04	2.15E-02	0.26	1.29(1.13-1.47)
83	SEMA4F	1.42E-04	2.15E-02	0.34	1.41(1.18-1.68)
84	PCOLCE	1.43E-04	2.15E-02	0.14	1.15(1.07-1.24)
85	SVEP1	1.43E-04	2.15E-02	0.19	1.21(1.1-1.33)
86	ZFP36	1.46E-04	2.15E-02	0.14	1.15(1.07-1.24)
87	ABCD2	1.48E-04	2.15E-02	1.06	2.89(1.67-4.99)
88	PPP3CA	1.55E-04	2.15E-02	0.21	1.23(1.11-1.37)
89	MAN2A1	1.57E-04	2.15E-02	0.20	1.22(1.1-1.34)
90	COMP	1.70E-04	2.36E-02	0.08	1.09(1.04-1.13)
91	RHOT1	1.74E-04	2.36E-02	0.28	1.32(1.14-1.53)
92	ARHGAP19	1.74E-04	2.36E-02	0.28	1.33(1.14-1.53)
93	FBN1	1.80E-04	2.36E-02	0.10	1.11(1.05-1.17)
94	PSMC4	1.82E-04	2.36E-02	0.20	1.22(1.1-1.36)
95	PRRX1	1.89E-04	2.36E-02	0.13	1.14(1.06-1.22)
96	LBP	1.98E-04	2.36E-02	0.36	1.43(1.18-1.72)
97	AEBP1	1.99E-04	2.36E-02	0.11	1.11(1.05-1.17)
98	XYLT1	2.00E-04	2.36E-02	0.20	1.22(1.1-1.35)
99	PADI2	2.00E-04	2.36E-02	0.18	1.19(1.09-1.31)
100	SFXN3	2.01E-04	2.36E-02	0.25	1.28(1.13-1.46)
101	INHBA	2.07E-04	2.36E-02	0.08	1.09(1.04-1.14)
102	EYA4	2.17E-04	2.36E-02	0.12	1.13(1.06-1.2)
103	PDGFRA	2.27E-04	2.36E-02	0.10	1.1(1.05-1.16)
104	PTH1R	2.31E-04	2.36E-02	0.41	1.5(1.21-1.86)
105	LTBP1	2.33E-04	2.36E-02	0.13	1.14(1.06-1.23)

106	PCDH9	2.36E-04	2.36E-02	0.19	1.21(1.09-1.34)
107	TUBB2A	2.40E-04	2.36E-02	0.12	1.13(1.06-1.2)
108	PALLD	2.40E-04	2.36E-02	0.14	1.15(1.07-1.23)
109	AHDC1	2.40E-04	2.36E-02	0.19	1.21(1.09-1.34)
110	WASF2	2.41E-04	2.36E-02	0.22	1.25(1.11-1.41)
111	PPAP2A	2.41E-04	2.36E-02	0.20	1.22(1.1-1.36)
112	FAP	2.50E-04	2.36E-02	0.10	1.1(1.05-1.16)
113	APH1B	2.51E-04	2.36E-02	0.25	1.29(1.12-1.47)
114	ZBTB40	2.53E-04	2.36E-02	0.36	1.44(1.18-1.74)
115	AKR7A2	2.59E-04	2.36E-02	0.23	1.26(1.11-1.43)
116	STK39	2.59E-04	3.17E-02	0.18	1.19(1.09-1.31)
117	ITGA5	2.71E-04	3.17E-02	0.22	1.25(1.11-1.41)
118	NET1	2.72E-04	3.17E-02	0.16	1.17(1.07-1.27)
119	TRIL	2.80E-04	3.17E-02	0.18	1.2(1.09-1.32)
120	RBMS1P1	2.89E-04	3.17E-02	0.24	1.27(1.11-1.44)
121	SNAI2	2.96E-04	3.17E-02	0.11	1.11(1.05-1.18)
122	RCN3	3.05E-04	3.17E-02	0.17	1.19(1.08-1.31)
123	GUCY1A2	3.07E-04	3.17E-02	0.15	1.16(1.07-1.26)
124	PER1	3.10E-04	3.17E-02	0.37	1.44(1.18-1.76)
125	HTRA1	3.26E-04	3.17E-02	0.14	1.15(1.06-1.23)
126	IGFBP4	3.26E-04	3.17E-02	0.13	1.14(1.06-1.23)
127	CXCL14	3.40E-04	3.17E-02	0.08	1.08(1.04-1.13)
128	LYPD3	3.40E-04	3.17E-02	0.22	1.24(1.1-1.4)
129	FBXO17	3.48E-04	3.17E-02	0.15	1.16(1.07-1.26)
130	LHFP	3.54E-04	3.17E-02	0.13	1.14(1.06-1.22)
131	LRRC15	3.61E-04	3.17E-02	0.10	1.1(1.04-1.16)
132	MPZ	3.63E-04	3.17E-02	0.32	1.38(1.16-1.64)
133	DACT1	3.65E-04	3.17E-02	0.15	1.16(1.07-1.27)
134	KIAA1462	3.65E-04	3.17E-02	0.19	1.2(1.09-1.33)
135	OMD	3.70E-04	3.55E-02	0.16	1.17(1.07-1.28)
136	PDE2A	3.92E-04	3.55E-02	0.33	1.4(1.16-1.68)
137	RAI14	4.00E-04	3.55E-02	0.16	1.17(1.07-1.27)
138	RECK	4.01E-04	3.55E-02	0.18	1.2(1.08-1.32)
139	GNB1	4.14E-04	3.55E-02	0.25	1.28(1.12-1.47)
140	TNFAIP6	4.14E-04	3.55E-02	0.12	1.13(1.06-1.21)
141	COL8A1	4.16E-04	3.55E-02	0.12	1.13(1.05-1.2)
142	RGS16	4.23E-04	3.55E-02	0.15	1.17(1.07-1.27)
143	RIN2	4.26E-04	3.55E-02	0.21	1.24(1.1-1.39)
144	ACTR1A	4.26E-04	3.55E-02	0.25	1.28(1.12-1.48)
145	FMO2	4.32E-04	3.55E-02	0.12	1.13(1.06-1.21)
146	NR2F1	4.35E-04	3.55E-02	0.12	1.13(1.06-1.21)
147	DKK2	4.40E-04	3.55E-02	0.16	1.18(1.08-1.29)
148	APBB2	4.45E-04	3.55E-02	0.19	1.21(1.09-1.35)
149	OLFML1	4.49E-04	4.05E-02	0.16	1.17(1.07-1.28)

150	SASH1	4.71E-04	4.05E-02	0.22	1.25(1.1-1.41)
151	BLMH	4.80E-04	4.05E-02	0.22	1.25(1.1-1.41)
152	CPEB1	5.01E-04	4.05E-02	0.26	1.29(1.12-1.5)
153	RPS6KA2	5.04E-04	4.05E-02	0.24	1.28(1.11-1.47)
154	CALCOCO1	5.04E-04	4.05E-02	0.29	1.34(1.13-1.57)
155	PINK1	5.24E-04	4.05E-02	0.28	1.32(1.13-1.54)
156	ANTXR1	5.25E-04	4.05E-02	0.18	1.2(1.08-1.33)
157	RPS23P8	5.37E-04	4.05E-02	0.31	1.37(1.14-1.63)
158	ADH1B	5.50E-04	4.05E-02	0.08	1.09(1.04-1.14)
159	GPC1	5.53E-04	4.05E-02	0.19	1.21(1.09-1.35)
160	PCBP3	5.56E-04	4.05E-02	0.44	1.56(1.21-2.01)
161	TMEM45A	5.57E-04	4.05E-02	0.11	1.12(1.05-1.19)
162	DCN	5.65E-04	4.05E-02	0.10	1.1(1.04-1.16)
163	PPP1R3C	5.69E-04	4.05E-02	0.14	1.15(1.06-1.24)
164	RARRES2	5.73E-04	4.05E-02	0.12	1.12(1.05-1.2)
165	PKD2	5.77E-04	4.05E-02	0.20	1.22(1.09-1.36)
166	MFAP5	5.85E-04	4.05E-02	0.07	1.08(1.03-1.12)
167	PLOD3	5.85E-04	4.05E-02	0.30	1.34(1.14-1.59)
168	SPARC	5.87E-04	4.05E-02	0.13	1.14(1.06-1.23)
169	RHOB	5.92E-04	4.05E-02	0.13	1.14(1.06-1.22)
170	OSR2	5.95E-04	4.05E-02	0.11	1.11(1.05-1.19)
171	SUPT5H	5.98E-04	4.05E-02	0.22	1.25(1.1-1.41)
172	PDP1	6.01E-04	4.05E-02	0.16	1.17(1.07-1.28)
173	TPT1	6.23E-04	4.05E-02	0.39	1.48(1.18-1.85)
174	SNORA31	6.32E-04	4.05E-02	0.40	1.49(1.19-1.88)
175	PDLIM2	6.37E-04	4.05E-02	0.18	1.19(1.08-1.32)
176	MOXD1	6.39E-04	4.05E-02	0.14	1.15(1.06-1.25)
177	THBS2	6.46E-04	4.05E-02	0.07	1.08(1.03-1.12)
178	APPL2	6.53E-04	4.05E-02	0.19	1.21(1.08-1.35)
179	ADRA2A	6.55E-04	4.05E-02	0.12	1.13(1.05-1.21)
180	LMOD1	6.56E-04	4.05E-02	0.18	1.19(1.08-1.32)
181	RPL21P75	6.57E-04	4.05E-02	0.27	1.31(1.12-1.53)
182	TGFB1I1	6.69E-04	4.05E-02	0.12	1.12(1.05-1.2)
183	YWHAB	6.75E-04	4.05E-02	0.27	1.31(1.12-1.53)
184	GNAI1	6.80E-04	4.05E-02	0.16	1.17(1.07-1.28)
185	TMEM222	6.81E-04	4.05E-02	0.35	1.42(1.16-1.73)
186	SERTAD3	6.92E-04	4.05E-02	0.18	1.2(1.08-1.33)
187	SNORA21	6.97E-04	4.05E-02	0.27	1.31(1.12-1.53)
188	PRKG1	6.98E-04	4.05E-02	0.25	1.28(1.11-1.48)
189	SRPX2	7.07E-04	4.05E-02	0.16	1.17(1.07-1.28)
190	UBL3	7.15E-04	4.05E-02	0.22	1.24(1.1-1.41)
191	NDRG3	7.21E-04	4.05E-02	0.24	1.27(1.1-1.45)
192	ZNF365	7.27E-04	4.05E-02	0.33	1.39(1.15-1.67)
193	CPQ	7.30E-04	4.05E-02	0.20	1.22(1.09-1.38)

194	RNASEL	7.34E-04	4.05E-02	0.25	1.29(1.11-1.49)
195	PLEKHA1	7.45E-04	4.05E-02	0.21	1.24(1.09-1.4)
196	HIPK1	7.46E-04	4.05E-02	0.14	1.15(1.06-1.24)
197	PTRF	7.51E-04	4.05E-02	0.15	1.17(1.07-1.28)
198	FLNC	7.53E-04	4.05E-02	0.22	1.25(1.1-1.42)
199	PDLIM3	7.54E-04	4.05E-02	0.11	1.12(1.05-1.2)
200	ITPKC	7.54E-04	4.05E-02	0.22	1.25(1.1-1.42)
201	HSPB2-C11orf52	7.55E-04	4.05E-02	0.17	1.19(1.08-1.31)
202	ASPN	7.56E-04	4.05E-02	0.08	1.08(1.03-1.13)
203	NPY	7.62E-04	4.05E-02	0.11	1.11(1.05-1.18)
204	KIAA0355	7.64E-04	4.05E-02	0.23	1.26(1.1-1.44)
205	KPNA3	7.75E-04	4.05E-02	0.24	1.27(1.1-1.45)
206	BCHE	7.88E-04	4.37E-02	0.12	1.13(1.05-1.21)
207	SUGCT	7.97E-04	4.37E-02	0.14	1.15(1.06-1.25)
208	PPEF1	8.15E-04	4.37E-02	0.30	1.35(1.13-1.61)
209	ZNF780B	8.28E-04	4.37E-02	0.29	1.34(1.13-1.58)
210	RPS16	8.42E-04	4.37E-02	0.32	1.38(1.14-1.67)
211	CRY2	8.52E-04	4.37E-02	0.38	1.47(1.17-1.83)
212	ERCC8	8.67E-04	4.37E-02	0.25	1.29(1.11-1.49)
213	MYL9	8.85E-04	4.37E-02	0.12	1.13(1.05-1.21)
214	COL10A1	8.88E-04	4.37E-02	0.08	1.09(1.03-1.14)
215	CLIC3	8.92E-04	4.37E-02	0.11	1.12(1.05-1.19)
216	PTPN1	9.00E-04	4.37E-02	0.30	1.35(1.13-1.61)
217	EMILIN1	9.11E-04	4.37E-02	0.16	1.18(1.07-1.3)
218	COX7C	9.22E-04	4.37E-02	0.25	1.28(1.11-1.49)
219	TMEM47	9.28E-04	4.37E-02	0.09	1.1(1.04-1.16)
220	FAM114A1	9.37E-04	4.37E-02	0.22	1.24(1.09-1.41)
221	EMCN	9.42E-04	4.37E-02	0.22	1.25(1.09-1.42)
222	EDNRA	9.42E-04	4.37E-02	0.12	1.13(1.05-1.21)
223	COL11A1	9.44E-04	4.37E-02	0.05	1.05(1.02-1.09)
224	ACTN4	9.50E-04	4.37E-02	0.18	1.2(1.08-1.33)
225	GFRA1	9.61E-04	4.37E-02	0.20	1.23(1.09-1.38)
226	SARS2	9.81E-04	4.37E-02	0.18	1.19(1.07-1.32)
227	COX7CP1	9.81E-04	4.37E-02	0.24	1.27(1.1-1.47)
228	ENPP1	9.82E-04	4.37E-02	0.15	1.16(1.06-1.27)
229	CRISPLD2	9.83E-04	4.37E-02	0.09	1.1(1.04-1.16)
230	CDC42	9.86E-04	4.37E-02	0.16	1.17(1.07-1.29)
231	ACTA2	9.89E-04	4.37E-02	0.09	1.1(1.04-1.16)

Abbreviations: pos positively associated, neg negatively associated, P P value, FDR faluse discovery rate, C Coefficient, HR Hazard Ratio, CI confidence interval.

Supplementary Table S2. The loadings of 341 genes in the first 2 components.

Genes	PC1	PC2	Genes	PC1	PC2	Genes	PC1	PC2
AADAC	0.008	-0.059	GJB1	0.022	-0.059	PPP3CA	-0.026	0.014
ABCD2	0.000	0.002	GLT8D2	-0.089	0.020	PRIM2	0.011	-0.010
ACOT13	0.010	-0.052	GMPR	0.037	-0.091	PRKG1	-0.025	0.014
ACTA2	-0.137	-0.049	GMPR2	0.005	-0.010	PRPS2	0.010	-0.062
ACTN4	-0.016	0.014	GNAI1	-0.015	0.070	PRRX1	-0.092	-0.019
ACTR1A	-0.019	0.005	GNB1	-0.011	0.013	PSMC4	-0.006	0.007
ADH1B	-0.108	-0.016	GPC1	-0.027	0.073	PSME2P2	0.011	-0.107
ADRA2A	-0.060	0.042	GPR124	-0.048	0.032	PTH1R	-0.005	0.026
AEBP1	-0.149	-0.012	GPRC5C	0.012	-0.032	PTPN1	-0.010	0.002
AHDC1	0.001	0.058	GSTZ1	0.014	-0.045	PTPRD	-0.038	0.023
AKAP12	-0.056	0.076	GUCY1A2	-0.016	0.024	PTRF	-0.082	0.032
AKR7A2	0.000	0.009	GZMB	-0.012	-0.124	RAB11FIP5	-0.016	0.027
ALDH5A1	0.035	-0.037	HIGD1B	-0.008	0.004	RAI14	-0.048	0.030
ANGPTL2	-0.076	0.013	HIPK1	-0.058	0.007	RARRES2	-0.081	0.003
ANTXR1	-0.049	0.005	HLA.DOB	0.013	-0.084	RBMS1P1	-0.016	0.033
AP3S1	-0.018	0.000	HP1BP3	0.000	0.012	RCL1	0.010	-0.023
APBB2	-0.036	0.043	HSD17B6	-0.055	-0.012	RCN3	-0.071	0.005
APH1B	0.005	0.005	HSPB2.C11orf52	-0.017	0.033	RECK	-0.063	0.015
APOD	-0.045	0.038	HSPB6	-0.004	0.059	RGS16	-0.066	-0.020
APPL2	-0.005	0.052	HSPB7	-0.015	0.017	RHOB	-0.042	0.042
ARHGAP19	0.002	0.018	HTRA1	-0.083	0.015	RHOBTB3	-0.075	0.103
ARNT	-0.002	0.028	ID3	-0.074	0.027	RHOT1	-0.004	0.028
ASAP3	-0.014	0.048	IGF2	-0.094	0.387	RIN2	-0.033	0.011
ASPN	-0.167	-0.080	IGFBP4	-0.086	0.039	RMI1	0.018	-0.058
AXL	-0.047	0.012	IL6R	0.018	-0.098	RNASEL	-0.010	0.004
BCAP31	0.006	-0.057	INHBA	-0.178	-0.110	RPL21P75	-0.001	0.011
BCHE	-0.064	0.005	ITGA5	-0.055	-0.025	RPS16	0.001	0.013
BLMH	-0.013	0.039	ITPKC	0.001	0.024	RPS23P8	0.000	0.026
BRCC3	0.016	-0.068	ITSN1	-0.016	0.042	RPS6KA2	-0.008	0.026
C1QTNF3	-0.083	0.001	JAM2	-0.048	0.027	SACS	-0.018	0.024
C6orf165	0.007	-0.002	KIAA0020	0.008	-0.046	SARS2	0.002	0.049
C9orf116	0.019	-0.005	KIAA0355	-0.016	0.037	SASH1	-0.019	0.027
CAAP1	0.014	-0.043	KIAA1462	-0.030	0.040	SDF2L1	-0.001	-0.065
CALCOCO1	-0.006	0.033	KIF26B	-0.048	0.006	SDHAP3	0.011	-0.021
CASP8AP2	0.006	-0.013	KPNA3	-0.015	0.013	SDR39U1	0.009	0.006
CCL13	0.000	-0.027	KRT18P38	0.004	-0.002	SEMA4F	0.002	0.034
CD302	-0.052	-0.001	LBP	-0.001	0.008	SENP6	-0.001	0.002

CD38	0.003	-0.099	LEFTY2	-0.005	0.058	SERTAD3	-0.010	0.025
CDC42	-0.012	-0.015	LHFP	-0.100	0.001	SFXN3	-0.035	0.004
CHAF1B	0.012	-0.030	LINC00338	0.017	-0.012	SH3PXD2A	-0.029	0.017
CIB1	0.013	-0.069	LMCD1	-0.036	-0.014	SIRT5	0.015	-0.038
CILP	-0.095	-0.001	LMOD1	-0.056	0.024	SLC25A1	0.003	-0.040
CLIC3	-0.050	0.031	LPAR2	0.014	0.009	SLC27A2	0.013	-0.025
CLIP3	-0.025	0.089	LRIF1	0.007	-0.009	SLC37A4	0.017	-0.006
CNOT4	0.007	-0.023	LRIG1	0.018	-0.011	SLC5A1	0.023	-0.085
COA4	0.015	-0.058	LRP1	-0.038	0.037	SLC7A11	0.019	-0.070
COL10A1	-0.153	-0.076	LRRC15	-0.130	-0.068	SLIT3	-0.023	0.073
COL11A1	-0.237	-0.152	LRRC17	-0.075	0.067	SNAI2	-0.133	-0.034
COL16A1	-0.088	0.014	LRRK1	0.002	-0.020	SNORA21	-0.002	0.039
COL5A1	-0.169	-0.038	LRRN3	-0.008	0.023	SNORA31	-0.009	0.013
COL8A1	-0.101	-0.029	LTBP1	-0.028	0.060	SNRPA1	0.014	-0.056
COMP	-0.132	-0.028	LUZP1	-0.013	0.022	SORBS1	-0.028	0.015
COPZ2	-0.072	-0.013	LYPD3	0.004	0.027	SPARC	-0.100	-0.025
COX7A2P2	0.011	-0.038	MAGEF1	0.007	0.001	SPDEF	0.041	-0.033
COX7C	0.005	0.013	MAGEL2	-0.012	0.051	SRPX2	-0.074	-0.011
COX7CP1	0.005	0.011	MAK	0.024	0.004	ST6GAL1	0.010	-0.056
CPEB1	-0.004	0.036	MAL	-0.026	0.081	STK39	-0.016	0.007
CPQ	-0.031	0.005	MAN2A1	-0.030	-0.045	STOML2	0.016	-0.041
CREB3	-0.001	-0.037	MCAT	0.011	-0.025	STXBP6	0.032	-0.123
CRISPLD2	-0.145	-0.049	MCM3	0.017	-0.016	SUGCT	-0.070	-0.018
CRY2	-0.004	0.017	MCM5	0.008	-0.059	SUPT5H	-0.006	0.025
CRYAB	-0.054	-0.017	MFAP4	-0.067	0.103	SURF2	0.011	-0.017
CXCL11	-0.008	-0.277	MFAP5	-0.122	0.009	SV2A	-0.005	0.068
CXCL14	-0.151	-0.028	MINOS1.NBL1	-0.093	-0.018	SVEP1	-0.065	-0.011
CYB561	0.012	-0.022	MOXD1	-0.065	-0.027	SVIL	-0.041	0.045
CYBA	0.007	-0.106	MPRIP	-0.022	0.050	SYDE1	-0.018	0.035
CYBRD1	-0.023	0.016	MPZ	0.002	0.019	SYK	0.018	-0.040
CYTH3	-0.010	0.019	MRPS11	0.009	-0.045	SYNGR2	0.002	-0.085
DACT1	-0.076	0.020	MUL1	0.002	0.003	TAP1	0.006	-0.216
DCHS1	-0.070	0.073	MXRA8	-0.077	0.071	TAP2	0.005	-0.134
DCN	-0.143	-0.036	MYL9	-0.066	0.022	TBCC	0.011	-0.011
DHRS4	0.012	-0.018	N4BP2L2	-0.004	0.015	TDP2	0.005	-0.045
DKK2	-0.047	0.006	NAT10	0.017	-0.014	TESK1	0.001	-0.022
DNAJA1	0.006	-0.066	NDRG3	0.001	0.027	TGFB1I1	-0.111	-0.005
ECM2	-0.099	0.003	NET1	-0.029	-0.010	THBS2	-0.188	-0.137
EDNRA	-0.093	-0.020	NFX1	0.009	-0.023	THOP1	0.007	-0.016

Gene			Gene			Gene		
EFHC2	0.038	-0.003	NPY	0.000	0.072	TIMP3	-0.133	0.017
EFTUD1	0.007	-0.027	NR2F1	-0.049	0.123	TIPIN	0.014	-0.044
EHD2	-0.044	0.018	NT5C	0.008	-0.011	TMEM158	-0.121	-0.074
EMC9	0.009	-0.029	NUAK1	-0.111	-0.004	TMEM204	-0.042	0.009
EMCN	-0.029	0.001	OLFML1	-0.074	0.011	TMEM222	0.004	0.006
EMILIN1	-0.066	0.015	OMD	-0.068	-0.013	TMEM256.PLSCR3	-0.025	0.039
ENDOG	0.013	-0.042	OSR2	-0.060	0.043	TMEM45A	-0.087	0.080
ENOX1	-0.030	0.016	OXLD1	0.015	-0.049	TMEM47	-0.069	0.053
ENPP1	-0.058	0.008	PADI2	-0.005	-0.006	TNFAIP6	-0.092	-0.106
ERCC8	-0.005	0.027	PAK4	0.004	0.045	TPT1	-0.009	0.012
ESD	-0.012	0.026	PALLD	-0.098	0.005	TRIL	-0.032	0.053
EYA4	-0.016	0.124	PCBP3	0.001	0.009	TRIM26	0.010	-0.037
FAH	0.002	-0.041	PCDH9	-0.010	0.058	TRIM27	0.014	-0.012
FAM114A1	-0.038	-0.004	PCK2	0.009	-0.070	TUBB2A	-0.073	0.020
FAM86B2	0.011	-0.005	PCOLCE	-0.100	0.023	TUBB6	-0.074	0.002
FAP	-0.151	-0.102	PDE2A	-0.012	0.023	UBD	-0.004	-0.282
FBN1	-0.156	-0.043	PDGFD	-0.081	0.037	UBL3	-0.018	0.026
FBXO17	-0.002	0.087	PDGFRA	-0.126	0.020	VAT1	-0.026	0.030
FCHSD2	0.003	-0.031	PDGFRB	-0.061	0.013	VCP	0.000	-0.047
FEN1	0.012	-0.055	PDLIM2	-0.054	-0.007	WARS	-0.003	-0.118
FGF1	-0.033	-0.002	PDLIM3	-0.114	-0.050	WASF2	-0.004	0.019
FLNC	-0.019	0.047	PDP1	-0.012	-0.030	WBP1L	-0.032	-0.008
FMO2	-0.039	-0.035	PDPN	-0.087	0.018	WDR3	0.024	-0.014
FN3KRP	0.005	-0.023	PER1	-0.007	0.016	WDR45B	0.007	-0.057
FOCAD	0.007	-0.019	PINK1	-0.006	0.011	WDR77	0.023	-0.010
FOXJ1	0.040	0.003	PIR	0.026	-0.103	XYLT1	-0.057	-0.002
FOXN3	-0.020	0.019	PKD2	-0.048	0.005	YWHAB	-0.008	0.009
FRYL	-0.002	-0.032	PLAA	0.005	-0.047	ZBTB40	0.001	0.036
FSTL3	-0.024	0.015	PLEKHA1	-0.009	0.046	ZCCHC24	-0.073	0.018
FXYD5	-0.035	-0.005	PLOD3	-0.012	-0.002	ZEB1	-0.102	0.009
FZD1	-0.073	-0.004	PLXDC1	-0.056	-0.006	ZFHX4	-0.044	0.024
GALNT10	-0.054	-0.007	POLA2	0.013	-0.036	ZFP36	-0.045	-0.013
GALNT12	0.021	-0.029	POLD3	0.015	-0.025	ZNF165	0.015	-0.033
GALNT6	0.018	-0.066	POLG	0.008	-0.025	ZNF365	-0.012	0.014
GCH1	-0.009	-0.123	PPAP2A	-0.054	-0.004	ZNF440	0.010	0.005
GCNT1	-0.001	-0.025	PPEF1	-0.024	-0.009	ZNF780B	0.002	0.019
GFPT2	-0.068	-0.015	PPP1R13L	-0.017	0.030	ZNHIT2	0.015	-0.019
GFRA1	-0.009	0.013	PPP1R3C	-0.036	0.036			

Supplementary Table S3. The coefficients of first 2 component in principal component analysis.

PC	Coef	SE	Z	P	HR
PC1	-0.02862	0.00464	-6.17	7.00E-10	0.97178
PC2	0.06856	0.00964	7.11	1.10E-12	1.07097

Supplementary Table S4. List of 155 OS-associated genes with FDR<0.05 in the Riester et al. study.

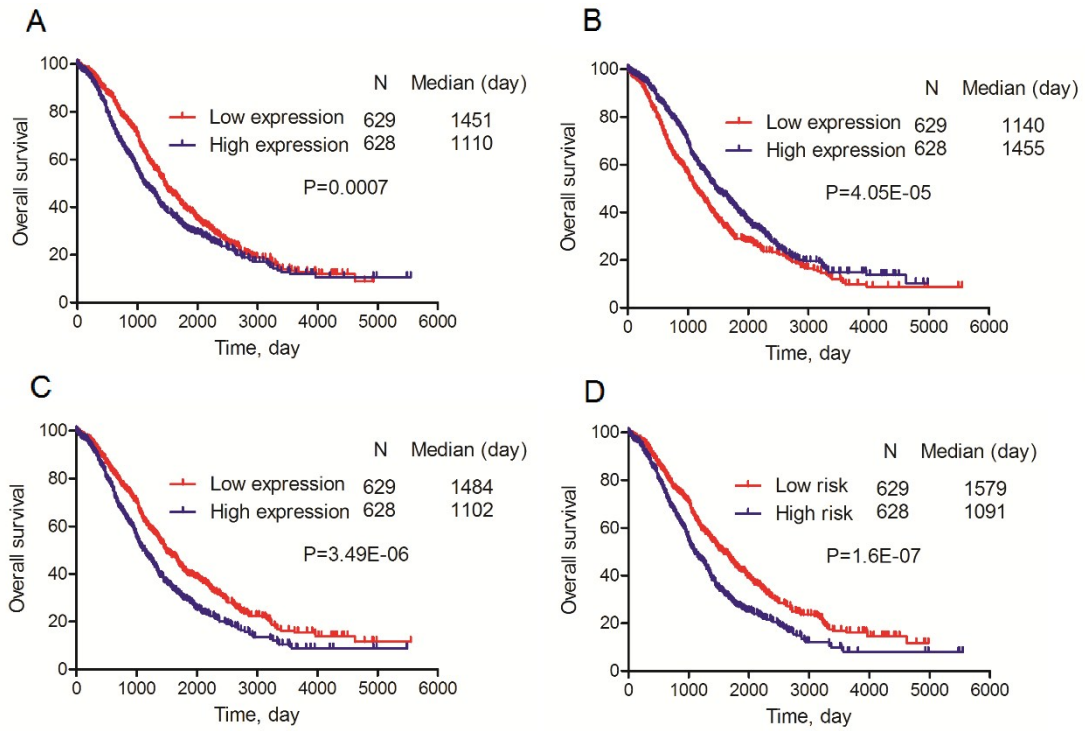| Genes	FDR	Genes	FDR	Genes	FDR	Genes	FDR
GMPR	2.56E-04	TESK1	2.33E-02	LTA4H	2.99E-02	KIF20B	4.19E-02
MFAP4	7.61E-04	MATN3	2.36E-02	BMI1	2.99E-02	TMEM134	4.19E-02
LRRC17	7.61E-04	ITGB7	2.42E-02	RB1	3.05E-02	PDGFRA	4.19E-02
GJB1	2.24E-03	ISG20	2.45E-02	PIR	3.05E-02	WDR77	4.19E-02
NUAK1	2.24E-03	ADH1B	2.45E-02	CHD1	3.05E-02	SAT1	4.19E-02
LEFTY2	2.24E-03	HLA.DOB	2.45E-02	PDE1A	3.15E-02	ARID5B	4.20E-02
DDB2	2.24E-03	EXTL2	2.45E-02	APBB2	3.15E-02	NT5C	4.23E-02
EDNRA	2.29E-03	COL16A1	2.49E-02	GSTZ1	3.19E-02	TAP1	4.23E-02
HSD17B6	3.98E-03	URI1	2.49E-02	COL8A1	3.28E-02	PDGFRB	4.23E-02
ZCCHC24	4.20E-03	SLC20A2	2.49E-02	AQP5	3.28E-02	ITPKC	4.24E-02
AP3S1	5.90E-03	JMJD1C	2.49E-02	RASA1	3.28E-02	CLDN10	4.33E-02
FOXJ1	9.64E-03	FERMT2	2.49E-02	SEMA4F	3.28E-02	P4HA2	4.33E-02
RECK	9.74E-03	KCNV1	2.49E-02	NCOA3	3.37E-02	SPOCK1	4.33E-02
PI3	1.26E-02	NFS1	2.49E-02	CUX1	3.37E-02	MARK4	4.33E-02
RAB11FIP5	1.26E-02	PDGFD	2.49E-02	RECQL	3.41E-02	HOXA5	4.33E-02
WDR45L	1.37E-02	GALNT10	2.49E-02	SNAI2	3.75E-02	SYDE1	4.54E-02
SVIL	1.37E-02	AVPI1	2.49E-02	RARB	3.75E-02	NR1H3	4.54E-02
GULP1	1.37E-02	DCN	2.49E-02	CD38	3.75E-02	CDC23	4.54E-02
APC	1.37E-02	GPC1	2.49E-02	COL11A1	3.83E-02	C6orf108	4.54E-02
STK39	1.40E-02	FSTL1	2.49E-02	BCHE	3.86E-02	APPL2	4.54E-02
XRCC4	1.44E-02	N4BP2L2	2.49E-02	DSE	3.86E-02	RIN2	4.57E-02
CSNK1G3	1.44E-02	NINJ1	2.63E-02	PDS5B	3.86E-02	HSD3B2	4.57E-02
CD302	1.65E-02	CTNNBL1	2.63E-02	SYT11	3.86E-02	PAF1	4.60E-02
ALDH1A2	1.66E-02	RHOT1	2.63E-02	SNTB2	3.86E-02	UCP2	4.64E-02
ECM2	1.68E-02	APOD	2.63E-02	TNFAIP6	3.90E-02	RPS6KA2	4.64E-02
AKAP12	1.82E-02	ST6GAL1	2.63E-02	LMO7	4.04E-02	CETN2	4.75E-02
PDPN	1.82E-02	HIST1H2BJ	2.64E-02	TUFT1	4.10E-02	LMOD1	4.76E-02
ZEB1	1.82E-02	SPDEF	2.76E-02	GRHPR	4.12E-02	LTBP1	4.76E-02
SIRT5	1.82E-02	CILP	2.76E-02	CCDC41	4.12E-02	UTP14C	4.76E-02
EYA4	1.97E-02	IGFBP6	2.76E-02	COL5A2	4.12E-02	GSTP1	4.76E-02
SPATA2	1.97E-02	PSMC4	2.76E-02	CNN1	4.12E-02	TJP1	4.76E-02
DUS1L	2.06E-02	FBL	2.76E-02	GFPT2	4.12E-02	ITSN1	4.76E-02
SLC7A11	2.09E-02	PALLD	2.76E-02	HLA.DOA	4.12E-02	PSMB8	4.84E-02
KIAA0564	2.19E-02	TIMP3	2.76E-02	PTPRCAP	4.12E-02	PSMD8	4.86E-02
ADARB1	2.19E-02	PTPN1	2.76E-02	GGNBP2	4.12E-02	IL2RG	4.87E-02
LGALS3BP	2.19E-02	KRT23	2.77E-02	MAN1B1	4.12E-02	COMP	4.89E-02
GZMB	2.19E-02	ALDH5A1	2.78E-02	SAMD4A	4.12E-02	ADNP	4.89E-02
CXCL14	2.32E-02	CXCL11	2.90E-02	TRIL	4.12E-02	NKG7	4.99E-02
PJA2	2.33E-02	FXYD1	2.96E-02	PACSIN3	4.19E-02		

Supplementary Table S5. List of 31 OS-associated genes with FDR<0.05 in the Willis et al. study.

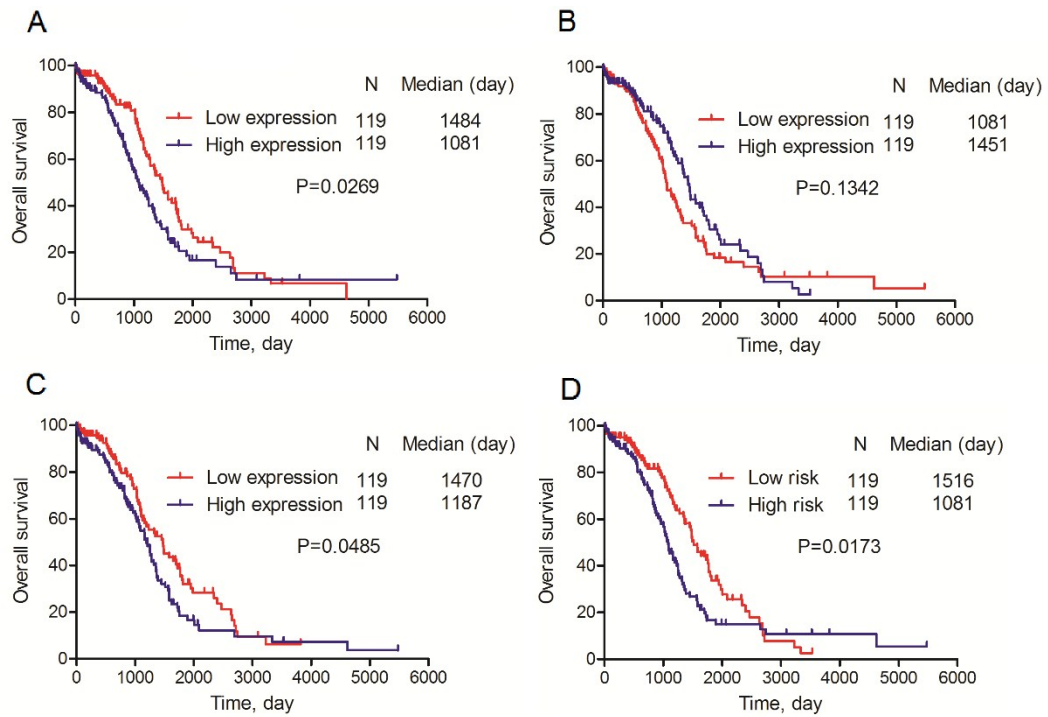| Genes	FDR	Genes	FDR	Genes	FDR	Genes	FDR
AXL	2.20E-02	CYBRD1	4.10E-02	PAXIP1	4.10E-02	ASAP3	4.80E-02
LRIG1	2.20E-02	PINK1	4.10E-02	CYB561	4.10E-02	FAM174B	4.80E-02
APC	2.90E-02	LRRN3	4.10E-02	POLA2	4.10E-02	AGR2	4.80E-02
SLC33A1	3.00E-02	AQP1	4.10E-02	CDH1	4.10E-02	SDR39U1	4.80E-02
NUCB2	3.00E-02	DES	4.10E-02	GMNN	4.10E-02	MAGT1	4.80E-02
POLD3	3.00E-02	ESR2	4.10E-02	SLC37A4	4.10E-02	GJB1	4.90E-02
RAB11FIP5	4.10E-02	GOLPH3	4.10E-02	XRCC4	4.70E-02	SDF2L1	5.00E-02
C19orf2	4.10E-02	XBP1	4.10E-02	BCHE	4.80E-02		

Supplementary Table S6. Univariate cox regression analysis of BCHE, GJB1 and RAB11FIP5 in EB dataset and TCGA RNA-Seq dataset.

Variable	C	P	HR
Training in EB dataset			
BCHE	0.1225	**0.00079**	1.13
GJB1	-0.2598	**4.0E-06**	0.77
RAB11FIP5	0.4037	**2.9E-06**	1.50
Combination	2.325	**3.6E-11**	10.22
Validation in TCGA RNA-Seq dataset			
BCHE	0.0702	0.054	1.07
GJB1	-0.0943	**0.026**	0.91
RAB11FIP5	0.237	0.053	1.27
Combination	1.000	**0.0029**	2.72

Abbreviations: C Coefficient, P P value, HR Hazard Ratio.

Supplementary Figure 1. K-M curve of 3 genes in this study which were significantly associated with overall survival in all three studies. (A) BCHE. (B) GJB1. (C) RAB11FIP5. (D) Combination of 3 genes.

Supplementary Figure 2. K-M curve of 3 genes in TCGA RNA-Seq data which were significantly associated with overall survival in all three studies. (A) BCHE. (B) GJB1. (C) RAB11FIP5. (D) Combination of 3 genes.