

Table S1. Clinical characteristics of members of the KC twins' family.

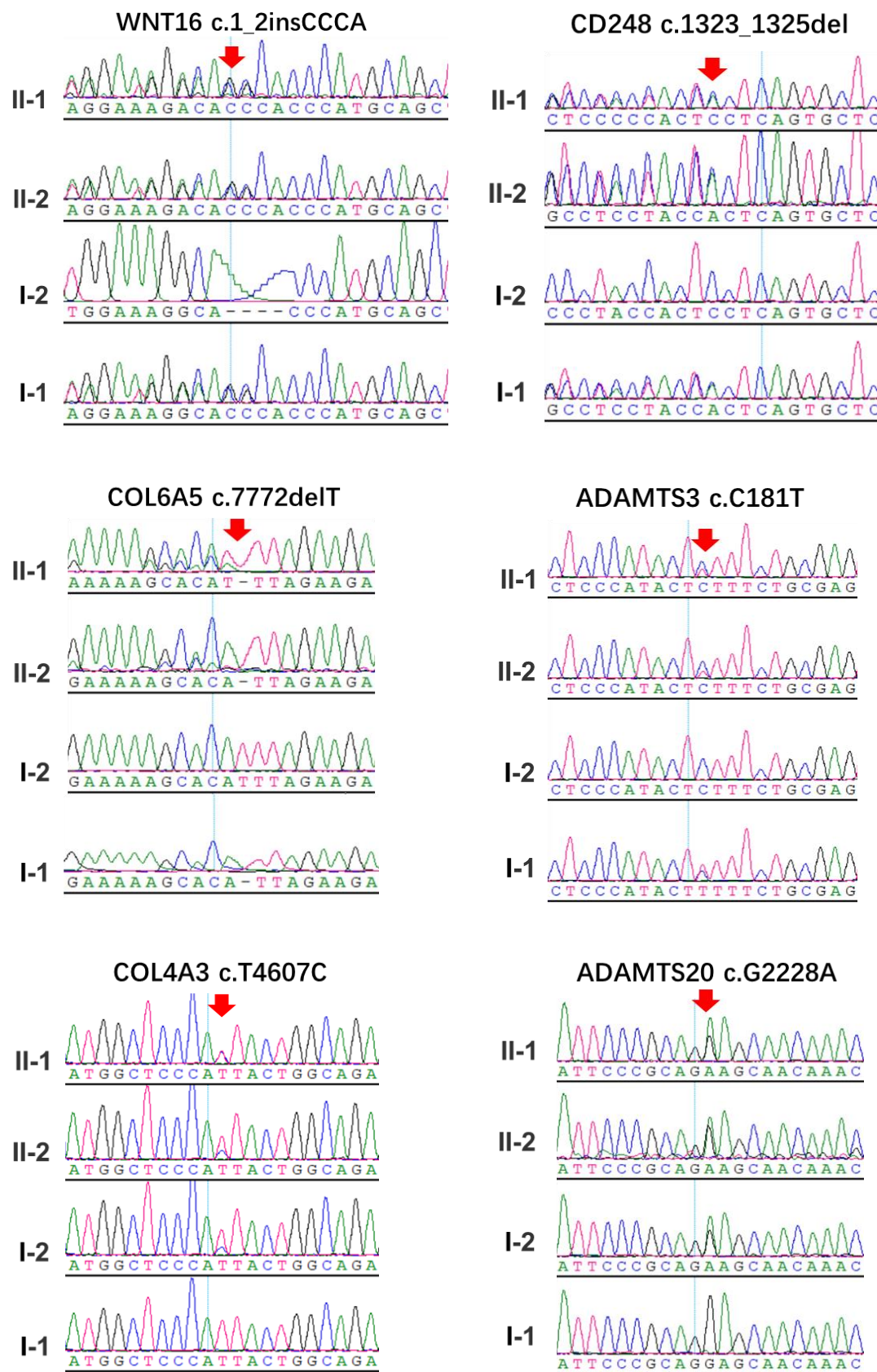
Sample name	Age	Phenotype	OD (Preoperative)					OS (Preoperative)					Other clinical symptoms
			CVA	Max front elevation	Max back elevation	Max curvature	CCT (μm)	CVA	Max front elevation	Max back elevation	Max curvature	CCT (μm)	
II-1	28	KC	0.3	120	215	97.2	289	0.4	78	195	85.7	291	Vogt's striae (+), Fleischer ring (+), Monson's sigh (+)
II-2	28	KC	0.3	37	60	74.8	422	0.4	43	63	76.1	427	Vogt's striae (+), Fleischer ring (+)
I-1	56	Normal	1.0	4	29	48.2	493	1.0	5	25	47.1	481	none
I-2	55	Normal	1.0	1	5	46.9	502	1.0	1	3	47.1	506	none

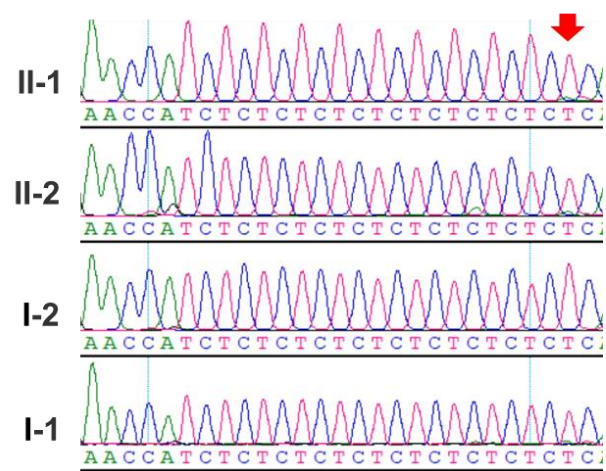
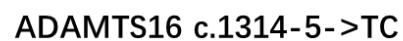
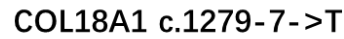
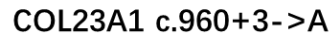
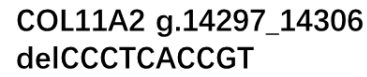
Notes: KC, keratoconus; CVA, corrected visual acuity; OD, right eye; OS, left eye; CCT, Thinnest central corneal thickness.

Table S2. The primers for Quantitative Real-time PCR (qRT-PCR)

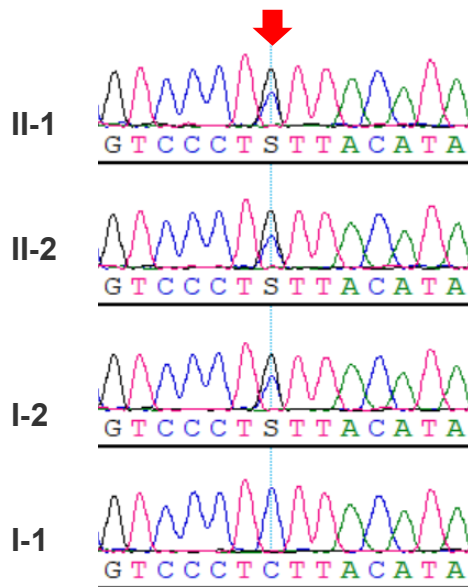
Gene name	Forwad 5'-3'	Reverse 5'-3'
FBN2	GTTTCTGCCAGTCATCCAGC	AGCTGCTTTGGCTTCGATCT
COL4A1	ACCAAAAGGTGACAAGGGTG	CTGGTTTTCCGGGTTACCT
GPC3	GCTGACCACCACTATTGGCA	GTTCCCTTCTTCGGCTGGAT
BMP4	GGAGCTTCCACCACGAAGAA	GGAAGCCCCTTCCCAATCA
COL4A2	CTGCCACTACTACGCCAACA	CCGGCTCACAGGTTCTTCAT
TNXB	GACCAGAGCAAGATCCTCATCTCA	AACTGGTGGTCACGTCAGTCA
ELN	TTTATCCAGGGGCTGGTCTC	AAAGGTAAGTGCGGGGAAGG
FMOD	GGGCATACAACCCTCTGCTT	GTGCTCCCCAGCCAACTAT
VIT	GATGCAGGAAAGCCTAAGGGA	CGGCTTTGACATCGCAGTTG
PTN	GAGCTGAGTGCAAGCAAACC	GCTCGCTTCAGACTTCCAGT
GPC4	TCGCTTCAGACCACATCACC	TCGGAAGGGAGGACCAGAAT
FBLN2	GATGGCGTGTCTGTGAAGA	TGAGTGCCTTGTAGCAGTGG
COL8A2	TCAAGCGGAGTGGATAAGGC	ACCGAATGACCCCAGTTCAC
PRELP	AGGTGCATCACCTGGATCAT	CGGGTCTTGGTCGTCTTGTT
ACAN	GTGGAGGAGTGGATCGTGAC	TCTGGTTTTCTGGCTCGGTG
MFAP5	TATTTTGCTGGCTTGCCCGA	TCCTCATGCTTTAGCCCCAG
ADAMTS15	CTCCGTGGGGAAGATGACAC	TTGTGCAAGACAGAGGGTCC
MMP3	AGGCAAGACAGCAAGGCATA	AGGTTCATGCTGGTGTCTCCTC
GAPDH	ATGCTGGCGCTGAGTACGT	AGCCCCAGCCTTCTCCAT

Figure S1. Sanger sequencing results of candidate gene variants

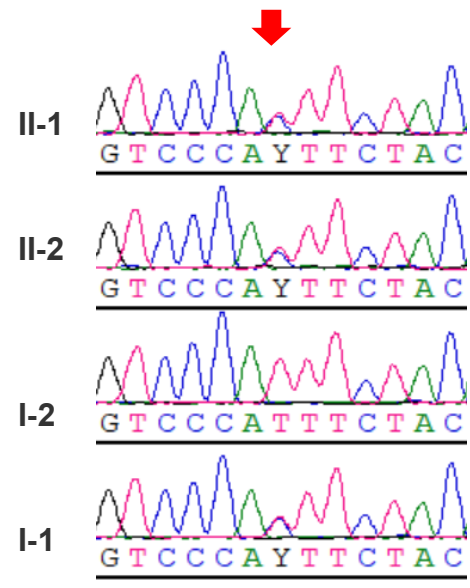




PKDREJ c.C1780G



PKDREJ c.T2708C



FGA c.T709C

