Vulnerability to shear stress caused by altered peri-endothelial matrix is a key feature of Moyamoya disease

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Supplementary Table 1

Primers used for RT-PCR

| Gene Name | 5'-primer | 3'-primer |
|-----------|-----------|-----------|
| VE-Cadherin | 5'-TGGATGAGAATGACAATGCC-3’ | 5'-TTGAACTTCACGTTCGTGG-3’ |
| CD31 | 5'-AGGTGTTGGTTGGAGGACTG-3’ | 5'-CGTGTAGTTGAGACTGACCT-3’ |
| vWF | 5'-AACACCTTTGATGGGAGCAT-3’ | 5'-TCACTCCTCTTGCCATTCTGGA-3’ |
| a-SMA | 5'-AGAACATGGCATTGCACCA-3’ | 5'-TACATGGCTGGGACATGGGA-3’ |
| HAS-2 | 5'-GTCTCAAATTCATCTGATCTC-3’ | 5'-ACATTTCCTTAAGTAGTCTG-3’ |
| CD105 | 5'-CCACTAGCCAGGTCTCGAG-3’ | 5'-GATGCAAGGAAGACACTGCTG-3’ |
| Oct-4 | 5'-GACAGGGGAGGGGAGGAGCTAGG-3’ | 5'-CTTCCCTCCAACCAGTGGCCAAAC-3’ |
| β-actin | 5'-TCCTGTGCGATTCCAGAAACT-3’ | 5'-GAAGCATTTCGGGTGGACGAT-3’ |
**Supplementary Table 2**

**Primers used for real-time PCR**

| Gene Name  | 5'-primer                      | 3'-primer                      |
|------------|--------------------------------|--------------------------------|
| hXylT1     | 5’-AAGAAGCCACCGAGTAGAC-3’      | 5’-TGGACACATCCTCCCGTG-3’       |
| hXylT2     | 5’-CGCTACAAGCTGGCGAT-3’        | 5’-ACTGTCCTGTCTCTGGAA-3’       |
| hGlcAT-I   | 5’-CCTGCTACTATCTATGTGTTAC-3’   | 5’-ACCACCAGGTGTGTAAGA-3’       |
| hChSy1     | 5’-GTTTGGCATACGTTAT-3’         | 5’-ACTCCTACTTCCTGGCTC-3’       |
| hChPF      | 5’-GACCCTCATTTCCGAAATG-3’      | 5’-GCCAGATGGCTGGTATAT-3’       |
| hChGn-1    | 5’-AGAAGAAATAATGAAGTCAAGAATAC-3’ | 5’-GAAGTAGTAGTCCACATCAG-3’       |
| hUST       | 5’-ACCATGGACCACCTCTAGTAA-3’    | 5’-CACACTTGCTACCTGGTGA-3’       |
| hC4ST-1    | 5’-AAACGCCAGCGGAAGAA-3’        | 5’-GGGATGAGGAGGATGAG-3’        |
| hC4ST-2    | 5’-GAGGGGAAAGTTCTTTTATG-3’     | 5’-CGGCTTAACAGCATAAT-3’        |
| hC6ST-1    | 5’-CAGGGGAAGGGAAGAGAGGAG-3’    | 5’-CCCTGCTGGTTGAAGAAC-3’       |
| hD4ST      | 5’-ACTCAGAGGGAGCGCTAT-3’       | 5’-ACCAAGTGAGAAGCATAAT-3’      |
| hGalNAc4S  | 5’-TCGTTGGACAGTAAGCAGAT-3’     | 5’-TGTAAGAAGCGATCAGTAAGCAGAT-3’ |
| hGAPDH     | 5’-ATGGGTTGTGAACGTAAGAAGTA-3’  | 5’-GGCAGTGGGATGGGATGG-3’       |
Figure S1. DNA analyses for RNF213  RNF213 SNP : G>A ss179362673
Figure S2. Three-dimensional models of arterial branches.

(a) ICA terminal  
(b) CCA terminal

Figure S3. Biosynthesis of chondroitin sulfate.
Figure S4. RT-PCR results of endothelial-differentiated iPSCs

A. Cadherin

HAEC C2  C1  MMD1  MMD2  MMD3
B. CD31

HAEC C2  C1  MMD1  MMD2  MMD3
C. vWF

HAEC C2  C1  MMD1  MMD2  MMD3
D. α-SMA

HAEC C2  C1  MMD1  MMD2  MMD3
E. HAS2

HAEC C2  C1  MMD1  MMD2  MMD3
F. CD105

| HAEC | C2 | C1 | MMD1 | MMD2 | MMD3 |
|------|----|----|------|------|------|
|      |    |    |      |      |      |

[Image of gel electrophoresis showing bands at 500, 400, 300, 200, and 100 base pairs]
G. β–actin
Figure S5. Network analysis by GeneMANIA

Networks
- Physical Interactions
- Co-expression
- Predicted
- Co-localization
- Pathway
- Genetic Interactions
- Shared protein domains
| Gene     | Description                                                                 | Rank |
|----------|-----------------------------------------------------------------------------|------|
| RNF213   | ring finger protein 213 [Source:HGNC Symbol; Acc: HGNC: 14539]               | N/A  |
| CHST11   | carbohydrate sulfotransferase 11 [Source: HGNC Symbol; Acc: HGNC: 17422]    | N/A  |
| UBC      | ubiquitin C [Source: HGNC Symbol; Acc: HGNC: 12468]                         | 1    |
| DBF4     | DBF4 zinc finger [Source: HGNC Symbol; Acc: HGNC: 17364]                    | 2    |
| CHST13   | carbohydrate sulfotransferase 13 [Source: HGNC Symbol; Acc: HGNC: 21755]   | 3    |
| CHST12   | carbohydrate sulfotransferase 12 [Source: HGNC Symbol; Acc: HGNC: 17423]   | 4    |
| CHST14   | carbohydrate sulfotransferase 14 [Source: HGNC Symbol; Acc: HGNC: 24464]   | 5    |
| CHST9    | carbohydrate sulfotransferase 9 [Source: HGNC Symbol; Acc: HGNC: 19698]    | 6    |
| CHST8    | carbohydrate sulfotransferase 8 [Source: HGNC Symbol; Acc: HGNC: 15993]    | 7    |
| CHST10   | carbohydrate sulfotransferase 10 [Source: HGNC Symbol; Acc: HGNC: 19650]   | 8    |
| HLA-G    | major histocompatibility complex, class I, G [Source: HGNC Symbol; Acc: HGNC: 4964] | 9    |
| PTPN1    | protein tyrosine phosphatase, non-receptor type 1 [Source: HGNC Symbol; Acc: HGNC: 9642] | 10   |
| RP5-1052I5.2 |  | 11   |
| HS6ST2   | heparan sulfate 6-O-sulfotransferase 2 [Source: HGNC Symbol; Acc: HGNC: 19133] | 12   |
| HS6ST3   | heparan sulfate 6-O-sulfotransferase 3 [Source: HGNC Symbol; Acc: HGNC: 19134] | 13   |
| MCRS1    | microsphérule protein 1 [Source: HGNC Symbol; Acc: HGNC: 6960]             | 14   |
| HS6ST1   | heparan sulfate 6-O-sulfotransferase 1 [Source: HGNC Symbol; Acc: HGNC: 5201] | 15   |
| PARP14   | poly(ADP-ribose) polymerase family member 14 [Source: HGNC Symbol; Acc: HGNC: 29232] | 16   |
| UST      | uronyl 2-sulfotransferase [Source: HGNC Symbol; Acc: HGNC: 17223]           | 17   |
| HS2ST1   | heparan sulfate 2-O-sulfotransferase 1 [Source: HGNC Symbol; Acc: HGNC: 5190] | 18   |
| UBE2K    | ubiquitin conjugating enzyme E2 K [Source: HGNC Symbol; Acc: HGNC: 4914]    | 19   |
| HLA-C    | major histocompatibility complex, class I, C [Source: HGNC Symbol; Acc: HGNC: 4933] | 20   |