**Supplementary Table 1：Copy number variants (CNVs) in plasma samples by analyzing the sequencing data(N=14).**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **number** | **gene** | **base alteration** | **amino acid alterations** | **function** | **CosmicID** | **Chr** | **Start** | **End** | **Mutation frequency** |
| 1 | KRAS | c.35G>T | p.G12V | missense | 1140133 | 12 | 25398283 | 25398284 | 24.44% |
|  | RNF43 | c.1201G>T | p.E401\* | nonsense | . | 17 | 56435935 | 56435936 | 8.63% |
|  | TP53 | c.743G>A | p.R248Q | missense | 10662 | 17 | 7577537 | 7577538 | 11.74% |
|  | FBXW7 | c.1513C>G | p.H505D | missense | . | 4 | 153244289 | 153244290 | 11.61% |
|  | KDR | c.1853C>T | p.S618F | missense | . | 4 | 55970943 | 55970944 | 4.39% |
|  | EPHA5 | c.401T>A | p.L134Q | missense | . | 4 | 66467867 | 66467868 | 7.69% |
|  | THBS2 | c.2504G>A | p.C835Y | missense | . | 6 | 169626308 | 169626309 | 1.08% |
| 1 | PTCH2 | c.3370T>A | p.Y1124N | missense | . | 1 | 45288328 | 45288329 | 0.23% |
|  | KRAS | c.35G>T | p.G12V | missense | 1140133 | 12 | 25398283 | 25398284 | 24.43% |
|  | RNF43 | c.1201G>T | p.E401\* | nonsense | . | 17 | 56435935 | 56435936 | 7.20% |
|  | TP53 | c.743G>A | p.R248Q | missense | 10662 | 17 | 7577537 | 7577538 | 10.23% |
|  | KDR | c.1853C>T | p.S618F | missense | . | 4 | 55970943 | 55970944 | 5.20% |
|  | EPHA5 | c.401T>A | p.L134Q | missense | . | 4 | 66467867 | 66467868 | 6.98% |
|  | FBXW7 | c.1513C>G | p.H505D | missense | . | 4 | 153244289 | 153244290 | 10.48% |
|  | MYC | c.466G>A | p.A156T | missense | 87795 | 8 | 128750928 | 128750929 | 0.41% |
|  | TRPC5 | c.154C>A | p.L52I | missense | . | X | 111195494 | 111195495 | 0.83% |
|  |  |  |  |  |  |  |  |  |  |
| 2 | PTCH2 | c.2185G>A | p.A729T | missense | 2171978 | 1 | 45293259 | 45293260 | 44.15% |
|  | FAT1 | c.6265G>A | p.V2089I | missense | . | 4 | 187541474 | 187541475 | 48.54% |
|  | TERT | c.-58-u4188G>A | . | promoter | . | 5 | 1299349 | 1299350 | 0.34% |
|  | ROS1 | c.977C>G | p.T326R | missense | . | 6 | 117715780 | 117715781 | 50.36% |
|  | TBP | c.422C[5>4] (std: c.422C[4] alt: c.426delC ) | p.M143\* | frameshift | . | 6 | 170871249 | 170871250 | 0.83% |
|  | TPMT | c.464T>C | p.L155S | missense | . | 6 | 18139223 | 18139224 | 53.32% |
|  | IRS2 | c.3812C>A | p.P1271Q | missense | . | 13 | 110434588 | 110434589 | 11.91% |
|  | MLH3 | c.1306A>G | p.N436D | missense | . | 14 | 75515052 | 75515053 | 60.68% |
|  | RNF43 | c.350G>C | p.R117P | missense | . | 17 | 56448296 | 56448297 | 0.49% |
|  | CCNE1 | c.835G>T | p.A279S | missense | . | 19 | 30313031 | 30313032 | 46.24% |
|  | TOP1 | c.419G>A | p.R140Q | missense | . | 20 | 39708807 | 39708808 | 44.26% |
|  | RUNX1 | c.722A>C | p.H241P | missense | . | 21 | 36206789 | 36206790 | 0.64% |
|  | ERG | c.601T>A | p.Y201N | missense | . | 21 | 39775439 | 39775440 | 0.31% |
| 2 | PTCH2 | c.2185G>A | p.A729T | missense | 2171978 | 1 | 45293259 | 45293260 | 47.99% |
|  | FAT1 | c.6265G>A | p.V2089I | missense | . | 4 | 187541474 | 187541475 | 46.76% |
|  | ROS1 | c.977C>G | p.T326R | missense | . | 6 | 117715780 | 117715781 | 45.96% |
|  | TPMT | c.464T>C | p.L155S | missense | . | 6 | 18139223 | 18139224 | 54.21% |
|  | OR5L2 | c.820G>T | p.A274S | missense | 4914499 | 11 | 55595513 | 55595514 | 1.02% |
|  | KRAS | c.35G>A | p.G12D | missense | 1135366 | 12 | 25398283 | 25398284 | 1.72% |
|  | IRS2 | c.3812C>A | p.P1271Q | missense | . | 13 | 110434588 | 110434589 | 10.73% |
|  | ACIN1 | c.1708C>T | p.R570W | missense | . | 14 | 23528493 | 23528494 | 0.35% |
|  | MLH3 | c.1306A>G | p.N436D | missense | . | 14 | 75515052 | 75515053 | 65.43% |
|  | ABCC11 | c.1704G[5>4] (std: c.1704G[4] alt: c.1708delG ) | p.V570Cfs\*43 | frameshift | . | 16 | 48239424 | 48239425 | 0.47% |
|  | CCNE1 | c.835G>T | p.A279S | missense | . | 19 | 30313031 | 30313032 | 45.20% |
|  | TOP1 | c.419G>A | p.R140Q | missense | . | 20 | 39708807 | 39708808 | 45.90% |
|  | ARAF | c.1358T>A | p.V453E | missense | . | X | 47428994 | 47428995 | 0.38% |
|  |  |  |  |  |  |  |  |  |  |
| 3 | OR2T4 | c.89C>A | p.A30D | missense | . | 1 | 248524970 | 248524971 | 0.89% |
|  | DDR2 | c.404G>A | p.R135H | missense | 898776 | 1 | 162724631 | 162724632 | 0.48% |
|  | PTCH2 | c.2185G>A | p.A729T | missense | 2171978 | 1 | 45293259 | 45293260 | 0.35% |
|  | PIK3CA | c.3132T>A | p.N1044K | missense | 12592 | 3 | 178952076 | 178952077 | 32.76% |
|  | INPP4B | c.1843C[4>3] (std: c.1843C[3] alt: c.1846delC ) | p.Q616Sfs\*3 | frameshift | . | 4 | 143045790 | 143045791 | 0.25% |
|  | FAT1 | c.6265G>A | p.V2089I | missense | . | 4 | 187541474 | 187541475 | 0.82% |
|  | FLT4 | c.1190A>T | p.Y397F | missense | . | 5 | 180053178 | 180053179 | 0.25% |
|  | TERT | c.-58-u4217delG | . | promoter | . | 5 | 1299378 | 1299379 | 0.32% |
|  | TERT | c.-58-u4634delG | . | promoter | . | 5 | 1299795 | 1299796 | 0.21% |
|  | BRD2 | c.1795G>C | p.A599P | missense | . | 6 | 32946118 | 32946119 | 0.59% |
|  | BRAF | c.1460\_1474delTGACAGCACCTACAC | p.V487\_P492delinsA | cds-indel | . | 7 | 140477833 | 140477848 | 14.27% |
|  | POM121L12 | c.427C[5>4] (std: c.427C[4] alt: c.431delC ) | p.P144Lfs\*77 | frameshift | . | 7 | 53103794 | 53103795 | 0.25% |
|  | FGFR1 | c.33G>A | p.M11I | missense | . | 8 | 38297857 | 38297858 | 46.80% |
|  | ADAMTSL1 | c.4210A>G | p.T1404A | missense | . | 9 | 18829935 | 18829936 | 0.75% |
|  | NOTCH1 | c.62-2A>T | . | splice-3 | . | 9 | 139438555 | 139438556 | 0.34% |
|  | CDH23 | c.5114G>A | p.G1705D | missense | . | 10 | 73537991 | 73537992 | 0.22% |
|  | ROBO3 | c.837T>A | p.C279\* | nonsense | . | 11 | 124740130 | 124740131 | 0.19% |
|  | ERBB3 | c.2549T>A | p.V850E | missense | . | 12 | 56491656 | 56491657 | 0.26% |
|  | C1S | c.235G>A | p.E79K | missense | . | 12 | 7170214 | 7170215 | 1.05% |
|  | AKT1 | c.567+2T>G | . | splice-5 | . | 14 | 105241410 | 105241411 | 0.33% |
|  | MLH3 | c.1306A>G | p.N436D | missense | . | 14 | 75515052 | 75515053 | 0.72% |
|  | ABCC11 | c.1731C[5>4] (std: c.1731C[4] alt: c.1735delC ) | p.Q579Sfs\*34 | frameshift | . | 16 | 48239397 | 48239398 | 0.22% |
|  | TP53 | c.637C>T | p.R213\* | nonsense | 10654 | 17 | 7578211 | 7578212 | 52.82% |
|  | NOTCH3 | c.3533A>T | p.H1178L | missense | . | 19 | 15290020 | 15290021 | 0.32% |
|  | SMARCB1 | c.425T>G | p.L142\* | nonsense | 29385 | 22 | 24143192 | 24143193 | 53.70% |
| 3 | PIK3CA | c.3132T>A | p.N1044K | missense | 12592 | 3 | 178952076 | 178952077 | 32.00% |
|  | BRAF | c.1460\_1474delTGACAGCACCTACAC | p.V487\_P492delinsA | cds-indel | . | 7 | 140477833 | 140477848 | 14.68% |
|  | FGFR1 | c.33G>A | p.M11I | missense | . | 8 | 38297857 | 38297858 | 57.98% |
|  | ERBB3 | c.2783A>G | p.E928G | missense | 1363010 | 12 | 56492632 | 56492633 | 0.32% |
|  | C1S | c.235G>A | p.E79K | missense | . | 12 | 7170214 | 7170215 | 0.58% |
|  | TP53 | c.637C>T | p.R213\* | nonsense | 10654 | 17 | 7578211 | 7578212 | 61.39% |
|  | SMARCB1 | c.425T>G | p.L142\* | nonsense | 29385 | 22 | 24143192 | 24143193 | 62.65% |
|  |  |  |  |  |  |  |  |  |  |
| 4 | DNMT3A | c.1402G>A | p.V468M | missense | . | 2 | 25464543 | 25464544 | 0.71% |
| 4 | DNMT3A | c.1402G>A | p.V468M | missense | . | 2 | 25464543 | 25464544 | 0.56% |
|  |  |  |  |  |  |  |  |  |  |
| 5 | NOTCH3 | c.709G>A | p.V237M | missense | . | 19 | 15302648 | 15302649 | 0.68% |
|  | NOTCH3 | c.499C>T | p.P167S | missense | 3283163 | 19 | 15302950 | 15302951 | 0.74% |
|  | BRD4 | c.3590A>G | p.K1197R | missense | . | 19 | 15350061 | 15350062 | 0.50% |
| 5 | CDKN2A | c.131dupA | p.Y44\* | frameshift | . | 9 | 21974695 | 21974695 | 0.68% |
|  |  |  |  |  |  |  |  |  |  |
| 6 | CHEK2 | c.608T>C | p.I203T | missense | . | 22 | 29121077 | 29121078 | 1.01% |
| 6 | FAM157B | c.208C>T | p.R70W | missense | . | 9 | 141107525 | 141107526 | 0.42% |
|  | TP53 | c.818G>A | p.R273H | missense | 10660 | 17 | 7577119 | 7577120 | 0.87% |
|  | CHEK2 | c.608T>C | p.I203T | missense | . | 22 | 29121077 | 29121078 | 1.15% |
|  | RET | c.884C>T | p.T295M | missense | . | 10 | 43601839 | 43601840 | 0.89% |
|  |  |  |  |  |  |  |  |  |  |
| 7 | 无突变检出 |  |  |  |  |  |  |  |  |
| 7 | CRYBG3 | c.7064A[4>3] (std: c.7064A[3] alt: c.7067delA ) | p.K2356Rfs\*3 | frameshift | . | 3 | 97599977 | 97599978 | 0.53% |
|  |  |  |  |  |  |  |  |  |  |
| 8 | MYC | c.173C>G | p.P58R | missense | . | 8 | 128750635 | 128750636 | 0.34% |
|  | FLCN | c.1009C>T | p.H337Y | missense | . | 17 | 17124712 | 17124713 | 0.63% |
|  | TERT | c.-58-u4217delG | . | promoter | . | 5 | 1299378 | 1299379 | 0.28% |
| 8 | NBPF10 | c.3537C[4>3] (std: c.3537C[3] alt: c.3540delC ) | p.R1181Gfs\*9 | frameshift | . | 1 | 145323702 | 145323703 | 0.34% |
|  | DNMT3A | c.1720G>C | p.A574P | missense | . | 2 | 25467154 | 25467155 | 0.54% |
|  | MLL3 | c.3614A>G | p.K1205R | missense | . | 7 | 151917705 | 151917706 | 3.46% |
|  | ROBO3 | c.1166T[4>3] (std: c.1166T[3] alt: c.1169delT ) | p.F390Sfs\*52 | frameshift | . | 11 | 124742286 | 124742287 | 0.34% |
|  | ERBB3 | c.1640C>T | p.A547V | missense | . | 12 | 56487908 | 56487909 | 0.40% |
|  | FLCN | c.1009C>T | p.H337Y | missense | . | 17 | 17124712 | 17124713 | 0.76% |
|  |  |  |  |  |  |  |  |  |  |
| 9 | VHL | c.119C>T | p.P40L | missense | 3364915 | 3 | 10183649 | 10183650 | 53.46% |
|  | NUP205 | c.461G>A | p.R154Q | missense | 2859226 | 7 | 135261134 | 135261135 | 47.82% |
|  | EIF3E | c.556A>G | p.M186V | missense | . | 8 | 109241339 | 109241340 | 47.92% |
|  | RET | c.833C>A | p.T278N | missense | 95173 | 10 | 43600606 | 43600607 | 48.75% |
|  | ATM | c.125A>G | p.H42R | missense | . | 11 | 108098554 | 108098555 | 42.99% |
|  | MAPK3 | c.1133C>T | p.A378V | missense | . | 16 | 30127995 | 30127996 | 47.44% |
|  | CDH1 | c.1888C>G | p.L630V | missense | . | 16 | 68856079 | 68856080 | 46.99% |
|  | BRD4 | c.3978G>T | p.E1326D | missense | . | 19 | 15349595 | 15349596 | 49.40% |
|  | AXL | c.10C>T | p.R4W | missense | . | 19 | 41725306 | 41725307 | 47.73% |
|  | TMPRSS2 | c.244T>G | p.Y82D | missense | 1740715 | 21 | 42866387 | 42866388 | 50.30% |
|  | NF2 | c.770C>T | p.P257L | missense | . | 22 | 30057287 | 30057288 | 54.78% |
| 9 | VHL | c.119C>T | p.P40L | missense | 3364915 | 3 | 10183649 | 10183650 | 52.38% |
|  | NUP205 | c.461G>A | p.R154Q | missense | 2859226 | 7 | 135261134 | 135261135 | 47.06% |
|  | EIF3E | c.556A>G | p.M186V | missense | . | 8 | 109241339 | 109241340 | 48.52% |
|  | RET | c.833C>A | p.T278N | missense | 95173 | 10 | 43600606 | 43600607 | 49.31% |
|  | ATM | c.125A>G | p.H42R | missense | . | 11 | 108098554 | 108098555 | 42.96% |
|  | MAPK3 | c.1133C>T | p.A378V | missense | . | 16 | 30127995 | 30127996 | 46.16% |
|  | CDH1 | c.1888C>G | p.L630V | missense | . | 16 | 68856079 | 68856080 | 47.99% |
|  | BRD4 | c.3978G>T | p.E1326D | missense | . | 19 | 15349595 | 15349596 | 50.87% |
|  | AXL | c.10C>T | p.R4W | missense | . | 19 | 41725306 | 41725307 | 47.45% |
|  | TMPRSS2 | c.244T>G | p.Y82D | missense | 1740715 | 21 | 42866387 | 42866388 | 47.04% |
|  | NF2 | c.770C>T | p.P257L | missense | . | 22 | 30057287 | 30057288 | 52.63% |
|  |  |  |  |  |  |  |  |  |  |
| 10 | MLL3 | c.347C>T | p.S116L | missense | . | 7 | 152027727 | 152027728 | 1.01% |
|  | OR4C6 | c.190T>G | p.L64V | missense | 4755632 | 11 | 55432831 | 55432832 | 6.20% |
|  | KRAS | c.35G>T | p.G12V | missense | 1140133 | 12 | 25398283 | 25398284 | 6.63% |
|  | TP53 | c.733G>A | p.G245S | missense | 121035 | 17 | 7577547 | 7577548 | 5.96% |
| 10 | 无突变检出 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| 11 | DDR2 | c.1831C>T | p.R611\* | nonsense | . | 1 | 162743360 | 162743361 | 19.08% |
|  | OR4C6 | c.38T>C | p.L13P | missense | . | 11 | 55432679 | 55432680 | 17.67% |
|  | KRAS | c.35G>A | p.G12D | missense | 1135366 | 12 | 25398283 | 25398284 | 34.04% |
|  | TP53 | c.713G>T | p.C238F | missense | 2744631 | 17 | 7577567 | 7577568 | 68.02% |
|  | PSG2 | c.787G>A | p.A263T | missense | 5009328 | 19 | 43576028 | 43576029 | 25.82% |
|  | PHACTR3 | c.289G>T | p.A97S | missense | 4941056 | 20 | 58322829 | 58322830 | 24.79% |
| 11 | DDR2 | c.1831C>T | p.R611\* | nonsense | . | 1 | 162743360 | 162743361 | 16.98% |
|  | ESR1 | c.1143T>A | p.C381\* | nonsense | . | 6 | 152332836 | 152332837 | 1.32% |
|  | OR4C6 | c.38T>C | p.L13P | missense | . | 11 | 55432679 | 55432680 | 16.00% |
|  | KRAS | c.35G>A | p.G12D | missense | 1135366 | 12 | 25398283 | 25398284 | 29.57% |
|  | TP53 | c.713G>T | p.C238F | missense | 2744631 | 17 | 7577567 | 7577568 | 55.18% |
|  | PSG2 | c.787G>A | p.A263T | missense | 5009328 | 19 | 43576028 | 43576029 | 22.52% |
|  | PHACTR3 | c.289G>T | p.A97S | missense | 4941056 | 20 | 58322829 | 58322830 | 22.38% |
|  |  |  |  |  |  |  |  |  |  |
| 12 | EPHA2 | c.50C>A | p.A17E | missense | . | 1 | 16482377 | 16482378 | 53.89% |
|  | ABL2 | c.2105G>C | p.C702S | missense | . | 1 | 179078251 | 179078252 | 46.55% |
|  | TERT | c.-58-u2554A>G | . | promoter | . | 5 | 1297715 | 1297716 | 49.23% |
|  | CDH23 | c.7900G>C | p.E2634Q | missense | . | 10 | 73565589 | 73565590 | 52.56% |
|  | ATM | c.3242A>G | p.N1081S | missense | 3720570 | 11 | 108143536 | 108143537 | 48.90% |
|  | KRAS | c.35G>A | p.G12D | missense | 1135366 | 12 | 25398283 | 25398284 | 0.98% |
|  | POTEG | c.149A>G | p.D50G | missense | 4049585 | 14 | 19553564 | 19553565 | 39.22% |
|  | NF1 | c.2316A[3>2] (std: c.2316A[2] alt: c.2318delA ) | p.N773Tfs\*18 | frameshift | . | 17 | 29554299 | 29554300 | 0.86% |
|  | NF1 | c.2316A[3>2] (std: c.2316A[2] alt: c.2318delA ) | p.N773Tfs\*18 | frameshift | . | 17 | 29554301 | 29554302 | 0.77% |
|  | TP53 | c.818G>A | p.R273H | missense | 10660 | 17 | 7577119 | 7577120 | 0.76% |
|  | LGALS13 | c.23A>G | p.Y8C | missense | . | 19 | 40095248 | 40095249 | 44.87% |
|  | PSG2 | c.895T>C | p.Y299H | missense | . | 19 | 43575920 | 43575921 | 51.17% |
| 12 | EPHA2 | c.50C>A | p.A17E | missense | . | 1 | 16482377 | 16482378 | 47.64% |
|  | ABL2 | c.2105G>C | p.C702S | missense | . | 1 | 179078251 | 179078252 | 47.66% |
|  | TERT | c.-58-u2554A>G | . | promoter | . | 5 | 1297715 | 1297716 | 47.93% |
|  | CDH23 | c.7900G>C | p.E2634Q | missense | . | 10 | 73565589 | 73565590 | 52.13% |
|  | ATM | c.3242A>G | p.N1081S | missense | 3720570 | 11 | 108143536 | 108143537 | 51.95% |
|  | KRAS | c.35G>A | p.G12D | missense | 1135366 | 12 | 25398283 | 25398284 | 2.06% |
|  | NF1 | c.2316A[3>2] (std: c.2316A[2] alt: c.2318delA ) | p.N773Tfs\*18 | frameshift | . | 17 | 29554299 | 29554300 | 1.53% |
|  | NF1 | c.2316A[3>2] (std: c.2316A[2] alt: c.2318delA ) | p.N773Tfs\*18 | frameshift | . | 17 | 29554301 | 29554302 | 1.58% |
|  | TP53 | c.818G>A | p.R273H | missense | 10660 | 17 | 7577119 | 7577120 | 1.99% |
|  | LGALS13 | c.23A>G | p.Y8C | missense | . | 19 | 40095248 | 40095249 | 44.66% |
|  | PSG2 | c.895T>C | p.Y299H | missense | . | 19 | 43575920 | 43575921 | 48.61% |
|  | MED12 | c.2456G>A | p.R819Q | missense | . | X | 70345918 | 70345919 | 0.87% |
|  |  |  |  |  |  |  |  |  |  |
| 13 | TERT | c.-58-u3594delT | . | promoter | . | 5 | 1298755 | 1298756 | 0.25% |
|  | NOTCH1 | c.658\_662delGTGCC | p.V220Lfs\*34 | frameshift | . | 9 | 139417382 | 139417387 | 0.52% |
|  | TSC2 | c.2672A>G | p.H891R | missense | . | 16 | 2126100 | 2126101 | 44.66% |
|  | MED12 | c.3355-2A>T | . | splice-3 | . | X | 70348445 | 70348446 | 1.23% |
| 13 | DNMT3A | c.2385G>C | p.W795C | missense | 133135 | 2 | 25462021 | 25462022 | 0.50% |
|  | POTEG | c.223A>G | p.S75G | missense | . | 14 | 19553638 | 19553639 | 0.35% |
|  | TSC2 | c.2672A>G | p.H891R | missense | . | 16 | 2126100 | 2126101 | 19.06% |
|  |  |  |  |  |  |  |  |  |  |
| 14 | KRAS | c.35G>A | p.G12D | missense | 1135366 | 12 | 25398283 | 25398284 | 3.50% |
|  | APC | c.6838T>A | p.S2280T | missense | . | 5 | 112178128 | 112178129 | 4.99% |
|  | TP53 | c.820G>T | p.V274F | missense | 10769 | 17 | 7577117 | 7577118 | 4.49% |
| 14 | KRAS | c.35G>A | p.G12D | missense | 1135366 | 12 | 25398283 | 25398284 | 17.02% |
|  | TP53 | c.820G>T | p.V274F | missense | 10769 | 17 | 7577117 | 7577118 | 15.29% |
|  | MAP3K1 | c.8C>T | p.A3V | missense | . | 5 | 56111407 | 56111408 | 0.48% |
|  | APC | c.6838T>A | p.S2280T | missense | . | 5 | 112178128 | 112178129 | 8.55% |
|  | IKBKAP | c.1903A>G | p.I635V | missense | . | 9 | 111663912 | 111663913 | 0.68% |