Table S1. Primers and PCR protocols for mutation screening of *MN1, NF2, KREMEN1* and *ZNRF3.*

MN1 (Accession No. NM_002430)

Designation	**Sequence**	**Exon**
MN1-1514F	5’-GGCTGTCATGCCCTATTGAT	Exon 1
MN1-1882R	5’-CTGGTGGGGATGATGACTTC	Exon 1
MN1-5000F	5’-GAGATCCACCCCCTGGAG	Exon 1
MN1-5375R	5’-GTCACCCGGGAAGTGAGAG	Exon 1
MN1-10120F	5’-GGCAGGACCAGGTGAAATTA	Exon 2
MN1-10440R	5’-CTCCCCAGACATTTGATCCT	Exon 2
MN1-50900F	5’-GGACGGTGCCTGTCTTGTAT	Exon 3
MN1-51296R	5’-TCAGCAATAGTGGCCCTTTC	Exon 3
MN1-51257F	5’-CCCCACCCCTCTGTTAATTT	Exon 3
MN1-51642R	5’-TAAAAGGGGAGGGGGTAAGA	Exon 3
MN1-51576F	5’-TTTCATAATAAGACAAGAGTTGCTTTC	Exon 3
MN1-51923R	5’-GCTTCCAGCAGGAGAAGAGA	Exon 3
MN1-51856F	5’-TTCCTGCAAACACAGTGCTC	Exon 3
MN1-52255R	5’-ATGGGAGAGGTGGAGGAGAT	Exon 3
MN1-52205F	5’-CATCCCAGGGAAGAAGGAG	Exon 3
MN1-52608R	5’-GCCATAAATGGCTTTTGCAG	Exon 3
MN1-52569F	5’-ACTTTGGGTGCTGCTGATG	Exon 3
MN1-52975R	5’-GAGAACCGCAGACTCAGACC	Exon 3
MN1-52931F	5’-CCTTCTGCCGGTCCTTTT	Exon 3
MN1-53303R	5’-AACGCTGGGAAAGTCAAAGA	Exon 3
MN1-53259F	5’-CGGGGAGCAAAGTGTCTTAAC	Exon 3
MN1-53613R	5’-GGATTGCCTAACACACAGCA	Exon 3
MN1-53564F	5’-TTGCACATGTAAAATATGAAAACTT	Exon 3
MN1-53931R	5’-TCCAAACCTACACCCCTACG	Exon 3

PCR reactions for exons 2 and 3 were performed in a 50 µl total reaction volume containing 1x PCR buffer, 1 mM dNTPs, 1.25 mM $MgCl_2$, 0.5 µM of each of the forward and reverse primers, 1 U Platinum Taq DNA Polymerase (Life Technologies, Foster City, USA) and 100 ng genomic DNA template. After denaturation for 2 min at 94 C, 30 cycles of 30 s at 94 C, 30 sec at 58 C and 1 min at 72 C were run, followed by a final extension for 3 min at 72 C. Amplified fragments were purified from agarose gels and directly sequenced using the Big Dye v1.1 cycle sequencing kit (Life Technologies) on an ABI-3100 Avant genetic analyzer (Life Technologies).
MN1 exon 1 is previously known to be difficult to amplify. Therefore, a special kit for challenging amplicons, KAPA2G Robust Hot Start (Kapa Biosystems,Woburn, M.A., U.S.), was used. PCR reactions for were performed in a 25 µl total reaction volume containing 50% KAPA Mix, 0.5 µM of each of the forward and reverse primers, 5% DMSO and 100 ng genomic DNA template. After denaturation for 3 min at 95 C, 35 cycles of 15 s at 95 C, 15 sec at 56 C and 1 min at 72 C were run, followed by a final extension for 2 min at 72 C. 1 µl PCR-product was used as template for a second PCR with the same protocol and program as the first PCR. Amplified fragments were purified from agarose gels and directly sequenced using the Big Dye v1.1 cycle sequencing kit (Life Technologies) on an ABI-3100 Avant genetic analyzer (Life Technologies).

NF2 (Primers are according to Jacoby LB, MacCollin M, Louis DN, Mohney T, Rubio MP, et al. (1994) Exon scanning for mutation of the *NF2* gene in schwannomas. Hum Mol Genet 3: 413-419.)

Designation	**Sequence**	**Exon**
NF2-exon1F	5'-GCTAAAGGGCTCAGAGTGCAG	Exon 1
NF2-exon1R	5'-GAGAACCTCTCGAGCTTCCAC	Exon 1
NF2-exon2F	5'-AGTGCAGAGAAAAGGTTTTATTAATGAT	Exon 2
NF2-exon2R	5'-TGGAAAGCTCACGTCAGCC	Exon 2
NF2-exon3F	5'-GCTTCTTTGAGGGTAGCACA	Exon 3
NF2-exon3R	5'-GGTCAACTCTGAGGCCAACT	Exon 3
NF2-exon4F	5'-CCTCACTTCCACTCACAGAG	Exon 4
NF2-exon4R	5'-CCCATGACCCAAATTAACGC	Exon 4
NF2-exon5F	5'-TGGCAGTTATCTTTAGAATCTC	Exon 5
NF2-exon5R	5'-TTAGACCACATATCTGCTATG	Exon 5
NF2-exon6F	5'-CATGTGTAGGTTTTTTATTTTGC	Exon 6
NF2-exon6R	5'-GCCCATAAAGGAATGTAAACC	Exon 6
NF2-exon7F	5'-CCATCTCACTTAGCTCCAATG	Exon 7
NF2-exon7R	5'-CTCACTCAGTCTCTGTCTAC	Exon 7
NF2-exon8F	5'-GAAGGTTGAATAAAATTTTGAGCCTC	Exon 8

NF2-exon8R	5’-GACAGGGAAAGATCTGCTGGACC	Exon 8
NF2-exon9F	5’-GACTTGGTGCTCCTAATTCCC	Exon 9
NF2-exon9R	5’-CCATTATCAGTAATGAAAACCAGG	Exon 9
NF2-exon10F	5’-TGCTACCTGCAAGAGCTCAA	Exon 10
NF2-exon10R	5’-CTGACCACACAGTGACATC	Exon 10
NF2-exon11F	5’-TCTTTGGGCCCTTGTGGCAC	Exon 11
NF2-exon11R	5’-CAGGAGACCAAGCTCCAGAA	Exon 11
NF2-exon12AF	5’-TTCAGCTAAGAGCACTGTGC	Exon 12A
NF2-exon12AR	5’-CGCTGCATTTCCTGCTCAG	Exon 12A
NF2-exon12BF	5’-GCTGAAAAGGCCCAGATCA	Exon 12B
NF2-exon12BR	5’-CTTGAGGACAACTGCTGTAG	Exon 12B
NF2-exon13F	5’-GGTGTCTTTTCCTGCTACCT	Exon 13
NF2-exon13R	5’-GGGAGGAAAGAGAACATCAC	Exon 13
NF2-exon14F	5’-TGTGCCCATTGCCTCTGTG	Exon 14
NF2-exon14R	5’-AGGGCACAGGGGGCTACA	Exon 14
NF2-exon15F	5’-TCTGCCCAAGCCCTGATGC	Exon 15
NF2-exon15R	5’-TGGTCCTGATCAGCAAAATAC	Exon 15
NF2-exon16F	5’-GGCATTGTTGATATCACAGGG	Exon 16
NF2-exon16R	5’-GGCAGCACCATCACCACATA	Exon 16
NF2-exon17F	5’-CTCTCAGCTTCTTCTCTGCT	Exon 17
NF2-exon17R	5’-CCAGCCAGCTCCCTATGGATG	Exon 17

PCR reactions were performed in a 50 µl total reaction volume containing 1x PCR buffer, 1 mM dNTPs, 1.25 mM $MgCl_2$, 0.5 µM of each of the forward and reverse primers, 1 U Platinum Taq DNA Polymerase (Life Technologies, Foster City, USA) and 100 ng genomic DNA template. After denaturation for 2 min at 94 C, 30-35 cycles of 30 s at 94 C, 30 sec at 58-60 C and 1 min at 72 C were run, followed by a final extension for 3 min at 72 C. Amplified fragments were purified from agarose gels and directly sequenced using the Big Dye v1.1 cycle sequencing kit (Life Technologies) on an ABI-3100 Avant genetic analyzer (Life Technologies).

KREMEN1 (ENSG00000183762)

Designation	**Sequence**	**Exon**
KREMEN1-7F	5’-CTGCTGATCCTACCCTTGGA	Exon 1
KREMEN1-468R	5’-GGGGTCGCTCACACTCAC	Exon 1
KREMEN1-1031F	5’-CCATGAATGTTGCCAGAAAA	Exon 2
KREMEN1-1312R	5’-TGAAAGGGGTTGGAAGAAGA	Exon 2
KREMEN1-1885F	5’-TGTGTCCTTTTCCCCAACAG	Exon 3
KREMEN1-2032R	5’-TCCTGTAAACCATCACATTGG	Exon 3
KREMEN1-2643F	5’-TGTTGCGAAATTCTTTTGTTTTT	Exon 4
KREMEN1-2825R	5’-ACACAGCCACAGAGTCATCA	Exon 4
KREMEN1-3424F	5’-GTTGAGGCTGATTGCTTGCT	Exon 5
KREMEN1-3701R	5’-GATGGGCACAGGGCATACT	Exon 5
KREMEN1-4298F	5’-GGCGTGGTGTCTTTTTCTCT	Exon 6
KREMEN1-4680R	5’-CCAAGGAGGCAAAGATGTC	Exon 6
KREMEN1-5568F	5’-CATAGCCCTGTCCCCAGTTA	Exon 7
KREMEN1-5957R	5’-CACCCAAGTGCTTTTGTCTTT	Exon 7
KREMEN1-7207F	5’-CTCCTTTCGAAAACCAACCA	Exon 8
KREMEN1-7372R	5’-GGGCAGCTCCCTCTTGTACT	Exon 8
KREMEN1-8774F	5’-CCCCACCCCATTTCATAGAT	Exon 9
KREMEN1-9007R	5’-ACCACAGGAGAGGTTGACCA	Exon 9
KREMEN1-9613F	5’-CGTGCCTAGGGCTGTACTTT	Exon 10
KREMEN1-9774R	5’-AAATTGCCACCCAGATATGC	Exon 10

PCR reactions were performed in a 50 µl total reaction volume containing 1x PCR buffer, 1 mM dNTPs, 1.25 mM $MgCl_2$, 0.5 µM of each of the forward and reverse primers, 1 U Platinum Taq DNA Polymerase (Life Technologies, Foster City, USA) and 100 ng genomic DNA template. After denaturation for 2 min at 94 C, 30 cycles of 30 s at 94 C, 30 sec at 57-58 C and 1 min at 72 C were run, followed by a final extension for 3 min at 72 C. Amplified fragments were purified from agarose gels and directly sequenced using the Big Dye v1.1 cycle sequencing kit (Life Technologies) on an ABI-3100 Avant genetic analyzer (Life Technologies).

ZNRF3 (ENSG00000183579)

Designation	**Sequence**	**Exon**
ZNRF3-223F	5’-AGCCTGCGACCCACAAAG	Exon 1
ZNRF3-593R	5’-CGGTGGTGTAGGTGGTGTAA	Exon 1
ZNRF3-570F	5’-GCGATTACACCACCTACACCA	Exon 1
ZNRF3-1060R	5’-GGTTCACAGGAGCTCTAGCC	Exon 1
ZNRF3-1448F	5’-CGTTACTTTTGGCTATAGCATCTG	Exon 2
ZNRF3-1734R	5’-TGCTGAAATGGAAGAGTGGA	Exon 2
ZNRF3-2233F	5’-GATTGCCAAGGCCAACTTT	Exon 3
ZNRF3-2453R	5’-GGGACAAGCCAAGCTCACTA	Exon 3
ZNRF3-3069F	5’-AAGCGCACCTTTTAACCAGA	Exon 4
ZNRF3-3269R	5’-GAGCCTGTGCCAAATGGT	Exon 4
ZNRF3-4545F	5’-GCTGGAGAGAGGCTGTGACT	Exon 5
ZNRF3-4734R	5’-GGTTACTGCTCACGGGCTAC	Exon 5
ZNRF3-6486F	5’-CGTACTGGACCCTCACACAG	Exon 6
ZNRF3-6744R	5’-CTAGGTCTTGGGCACCTCTG	Exon 6
ZNRF3-8167F	5’-GCAGACTTGTGTCCCCTCTC	Exon 7
ZNRF3-8394R	5’-ACGGTGGTTCTGAGTGTTCC	Exon 7
ZNRF3-8963F	5’-TATGCTCAGCCCTGCCTACT	Exon 8
ZNRF3-9984F	5’-TGCAGCCTGGAGATGAACTA	Exon 8
ZNRF3-10008R	5’-AGGGAGGAGTTGCTGCTGTA	Exon 8
ZNRF3-10816R	5’-AGACAAGACGACCCTGATGG	Exon 8
ZNRF3-13355F	5’-CCTCCCCTGATGATTGTTCT	Exon 9
ZNRF3-13472R	5’-CCATACAGTTCCCAATTTCCA	Exon 9

PCR reactions were performed in a 50 µl total reaction volume containing 1x PCR buffer, 1 mM dNTPs, 1.25 mM $MgCl_2$, 0.5 µM of each of the forward and reverse primers, 1 U Platinum Taq DNA Polymerase (Life Technologies, Foster City, USA) and 100 ng genomic DNA template. After denaturation for 2 min at 94 C, 30 cycles of 30 s at 94 C, 30 sec at 58 C and 2 min at 72 C were run, followed by a final extension for 3 min

at 72 C. Amplified fragments were purified from agarose gels and directly sequenced using the Big Dye v1.1 cycle sequencing kit (Life Technologies) on an ABI-3100 Avant genetic analyzer (Life Technologies).