**Supplemental Materials & Methods**

**Reagents**

AZD4547 was synthesized at Chugai Pharmaceutical Co. Ltd., according to the procedure described in patent publications WO2008075068. NVP-BGJ398, PD173074, cediranib, and dovitinib were purchased from Active Biochem and Sigma-Aldrich. The following primary antibodies (Cell Signaling Technology) were used: anti-phospho-FGF receptor (pFGFR-Tyr653/654, #3471), anti-phospho-ERK1/2 (pERK-The202/Tyr204; #9101), anti-ERK1/2 (ERK; #9102), anti-phospho-AKT (pAKT-Ser473; #9271), anti-AKT (AKT; #9272), anti-phospho-MEK1/2 (pMEK-Ser217/Ser221; 9121), anti-MEK1/2 (MEK; #9122), anti-phospho-FRS (pFRS-Tyr196; #3864), anti-p21 (p21; #2946), anti-phospho-Rb (pRB-Ser780; #3590), anti-phospho-STAT3 (pSTAT3-Tyr705; #9145), anti-STAT3 (STAT3; #4904), anti-phospho-STAT1 (pSTAT1-Tyr701; #9171), and anti-STAT1 (STAT1; #9172). Primary antibodies against FGFR3 (sc-9007), FRS2a (sc-17841), Cyclin D1 (sc-753), Rb (sc-7905), p53 (sc-136), and Actin (sc-10731) were obtained from Santa Cruz Biotechnology. Primary antibodies against BAIAP2L1 (HPA021257) and the FLAG epitope tag (A8592) were obtained from Sigma Aldrich Co., LLC. A primary antibody raised against the Myc tag (ab13836) was purchased from Abcam, PLC., and an anti-p27Kip1 antibody (610242) was purchased from BD Transduction LaboratoriesTM. Horseradish peroxidase-conjugated secondary antibodies against rabbit IgG (NA934V) and mouse IgG (NA931V) were obtained from GE Healthcare Life Sciences.

**PCR and Sanger sequencing of *FGFR3-BAIAP2L1* gene fusions**

PCR (42 cycles of 10 sec at 94°C, 15 sec at 55°C, and 1 min at 68°C) was performed with Tks Gflex DNA Polymerase (TAKARA BIO INC.) and the primers 5′-TGTTTGACCGAGTCTACACTCACC-3′ and 5′-GACATGTCCCAGTTCAGTTGAC-3′. PCR products were sequenced bidirectionally using a BigDye Terminator Kit and a DNA Analyzer 3730xl (Applied Biosystems). The following primers were used for Sanger sequencing: 5′-CAACTGCACACACGACCTGTA-3′ and 5′-CCATCGTAGTAGGCTTTTCCTG-3′.

**Generation of Rat-2 or 3T3 stable transductants**

Plasmids encoding wild type (WT) FGFR3 (NP\_001156685.1), F3-B, and BAIAP2L1 (NP\_061330.2) were purchased from GeneCopoeia. The F3-B plasmid encoded amino acids (aa) 1–760 of FGFR3 and aa 18–511 of BAIAP2L1. The F3-ΔBAR plasmid lacked the BAR domain (aa 18–229) of BAIAP2L1. The FGFR3 WT, F3-B, F3-B-ΔBAR, and BAIAP2L1 coding regions were subcloned into the pReceiver-Lv156 lentiviral vector (GeneCopoeia, Inc.). Lentiviruses were produced with the Lenti-Pac™ Lentiviral Packaging System (GeneCopoeia, Inc.). Rat-2 cells or 3T3 cells were infected with lentiviruses, and stable transductants were selected in puromycin (1 µg/mL medium).

**siRNA experiments**

Cells were seeded into 96-well plates and transfected using Lipofectamine® RNAiMAX (Life Technologies) and siRNA pools (ON-TARGET*plus* SMARTpools against human *FGFR3* or *BAIAP2L1* mRNA, or the ON-TARGET*plus* Non-Targeting Control Pool; Thermo Fisher Scientific Inc.). At 96 h post-transfection, cell viabilities were measured with the CellTiter-Glo® Luminescent Cell Viability Assay Kit (Promega). *FGFR3*-*BAIAP2L1* fusion-specific siRNAs (5′-CCACCGACAAUGUUAUGGA-3′ and 5′-CACCGACAAUGUUAUGGAA-3′) were synthesized by Thermo Fisher Scientific Inc.