Figure S1. Prognostic analysis of 13 biliary tract cancer patients with recommendation of targeted agent in the chemotherapy group. (A and B) Kaplan-Meier statistical analyses of the progression-free survival (PFS) and overall survival (OS) of 13 patients with recommendation of a targeted agent who underwent conventional chemotherapy.

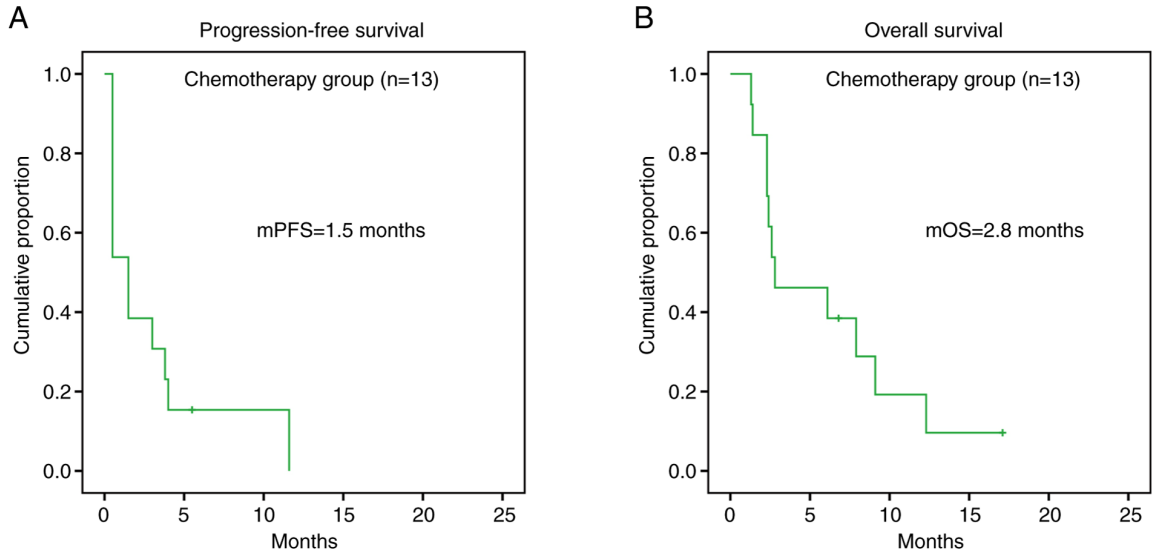

Figure S2. Imaging findings of the representative case of the patient with gallbladder carcinoma who received targeted therapy. (A) Result of the magnetic resonance cholangiopancreatography (MRCP) was obtained on December 23, 2014 prior to the study. (B) The liver enhanced magnetic resonance scan was achieved at the first review on April 21, 2015. (C and D) The results of computed tomography (CT) on this gallbladder carcinoma patient was obtained after 4 and 6 months of receiving the precision therapy.

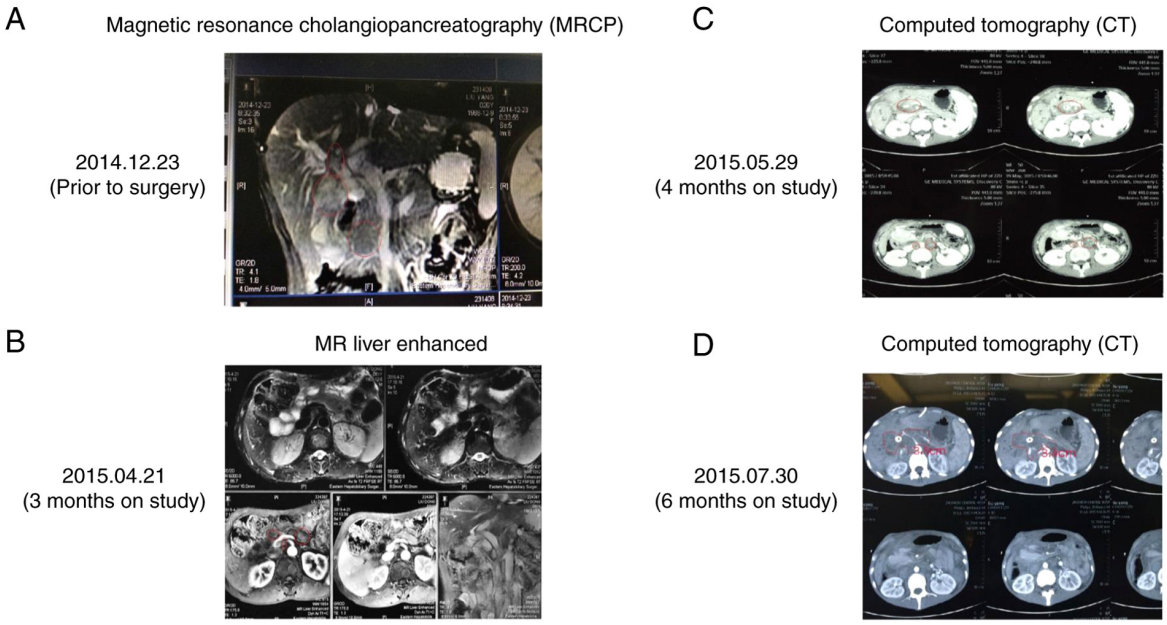

Figure S3. Prognostic analysis of 8 gallbladder carcinoma patients carrying ERBB pathway mutations in the targeted therapy group and the chemotherapy group. Among the 8 gallbladder carcinoma patients, 3 patients received targeted therapy, while 5 patients underwent conventional chemotherapy. (A and B) Kaplan-Meier statistical analyses of the progression-free survival (PFS) with P=0.122 and overall survival (OS) with P=0.051 of the two groups. *ERBB*, Erb-B2 receptor tyrosine kinase.

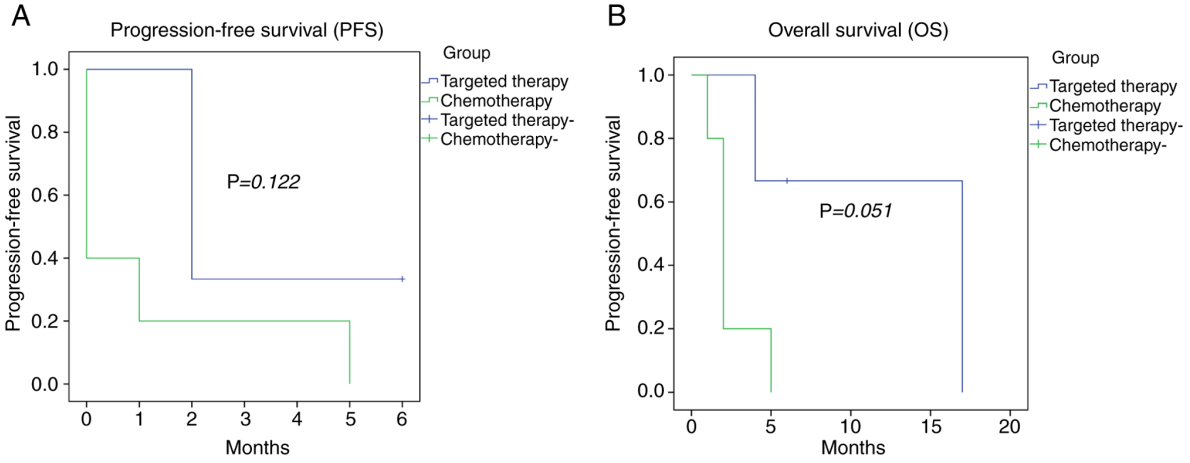

Table SI. Information in regards to the targetable altered genes corresponding to the biological agents.

Mutated genes	Recommended drugs
ATM	Daunorubicin, olaparib, rapamycin
BRAF	Sorafinib, trametinib
CDK6	Palbociclib
CDKN2A	Palbociclib
ERBB2	Trastuzumab, lapatinib
ERBB3	Trastuzumab, lapatinib
ERBB4	Lapatinib, axitinib
FGFR3	Pazopanib
FLT3	Rapamycin, sorafinib, sunitinib
FLT4	Pazopanib, sunitinib
KRAS	Cetuximab (invalid), panitumumab (invalid), gefitinib (invalid), erlotinib (invalid), everolimus (invalid)
MAP2K1 (MEK1)	Trametinib
MET	Crizotinib
PDGFRA	Imatinib, bevacizumab
PDGFRB	Rapamycin
PIK3CA	Everolimus, temsirolimus
PIK3R2	Cabozantinib
PTCH1	Vismodegib
RET	Regorafenib
SRC	Dasatinib
VHL	Sorafinib, sunitinib, bevacizumab

Table SII. Follow-up of the 49 patients with biliary tract cancers.

Patient ID	Sex	Age (years)	Cancer type	OS (months)	PFS (months)
BTC-001	M	64	Gallbladder carcinoma	2.8	0.5
BTC-002	F	46	Cholangiocarcinomas	3.2	1.0
BTC-003	F	66	Cholangiocarcinomas	6.1	3.8
BTC-004	F	55	Gallbladder carcinoma	7.9	7.5
BTC-005	M	46	Cholangiocarcinomas	5.6	5.0
BTC-006	F	51	Gallbladder carcinoma	6.8	5.5
BTC-007	M	59	Gallbladder carcinoma	6.9	6.5
BTC-008	M	60	Cholangiocarcinomas	40.8	40.5
BTC-009	M	58	Cholangiocarcinomas	1.4	0.5
BTC-010	M	58	Cholangiocarcinomas	24.8	20.5
BTC-011	F	59	Cholangiocarcinomas	8.9	4.5
BTC-012	M	60	Cholangiocarcinomas	4.7	2.5
BTC-013	M	60	Gallbladder carcinoma	21.9	21.0
BTC-014	M	72	Cholangiocarcinomas	18.8	13.5
BTC-015	M	67	Cholangiocarcinomas	9.9	3.0
BTC-016	F	63	Gallbladder carcinoma	2.3	1.5
BTC-017	M	35	Cholangiocarcinomas	2.4	0.5
BTC-018	M	60	Gallbladder carcinoma	17.9	2.5
BTC-019	M	46	Gallbladder carcinoma	2.6	0.5
BTC-020	F	71	Gallbladder carcinoma	4.8	2.5
BTC-021	M	66	Cholangiocarcinomas	2.3	0.5
BTC-022	F	61	Cholangiocarcinomas	17.1	11.6
BTC-023	M	58	Gallbladder carcinoma	1.3	0.5
BTC-024	F	38	Cholangiocarcinomas	5.9	0.5
BTC-025	M	51	Cholangiocarcinomas	12.3	1.5
BTC-026	M	65	Cholangiocarcinomas	12.9	6.5
BTC-027	M	68	Cholangiocarcinomas	14.8	14.0
BTC-028	M	55	Cholangiocarcinomas	9.7	5.0
BTC-029	M	38	Cholangiocarcinomas	22.5	21.5
BTC-030	F	66	Gallbladder carcinoma	5.6	5.0
BTC-031	F	65	Gallbladder carcinoma	4.1	1.0
BTC-032	M	53	Gallbladder carcinoma	9.6	4.5
BTC-033	M	61	Cholangiocarcinomas	24.8	23.5
BTC-034	M	62	Cholangiocarcinomas	15.8	7.5
BTC-035	M	58	Gallbladder carcinoma	15.5	6.0
BTC-036	M	65	Gallbladder carcinoma	1.7	0.5
BTC-037	F	64	Gallbladder carcinoma	18.5	17.5
BTC-038	F	56	Cholangiocarcinomas	21.8	12.0
BTC-039	F	52	Gallbladder carcinoma	6.5	1.9
BTC-040	M	63	Cholangiocarcinomas	7.8	3.5
BTC-041	F	55	Gallbladder carcinoma	13.2	2.8
BTC-042	M	53	Cholangiocarcinomas	2.3	0.5
BTC-043	F	56	Gallbladder carcinoma	5.7	3.5
BTC-044	M	65	Cholangiocarcinomas	7.9	4.0
BTC-045	M	46	Cholangiocarcinomas	18.4	2.9
BTC-046	M	52	Cholangiocarcinomas	13.3	12.6
BTC-047	M	55	Gallbladder carcinoma	5.2	5.0
BTC-048	F	26	Gallbladder carcinoma	12.9	6.5
BTC-049	M	64	Cholangiocarcinomas	9.1	3.0

OS, overall survival; PFS, progression-free survival; M, male; F, female.

Table SIII. Gene list of the targeted next generation sequencing (NGS).

Gene mutation												
ABL1	*BCL2L2*	*CDK4*	*DDR2*	*FAS*	*GATA4*	*INPP4B*	*MAGI2*	*NF2*	*PIK3CG*	*RBM10*	*SOX9*	*TSC2*
ABL2	*BCL6*	*CDK6*	*DICER1*	*FAT1*	*GATA6*	*IRF2*	*MAP2K1*	*NFE2L2*	*PIK3R1*	*RET*	*SPEN*	*TSHR*
ACVR1B	*BCOR*	*CDK8*	*DNMT3A*	*FBXW7*	*GID4*	*IRF4*	*MAP2K2*	*NFKBIA*	*PIK3R2*	*RICTOR*	*SPOP*	*TYK2*
ACVR2A	*BCORL1*	*CDKN1A*	*DOT1L*	*FGF10*	*GLI1*	*IRS2*	*MAP2K4*	*NKX2-1*	*PKD2*	*RNF43*	*SPTA1*	*U2AF1*
ADAM29	*BIRC5*	*CDKN1B*	*EGF*	*FGF14*	*GLI2*	*ITK*	*MAP3K1*	*NOTCH1*	*PLA2G1B*	*ROCK1*	*SRC*	*VEGFA*
AKT1	*BLK*	*CDKN2A*	*EGFR*	*FGF19*	*GLI3*	*JAK1*	*MAP4K5*	*NOTCH2*	*PLCG2*	*ROCK2*	*SRMS*	*VHL*
AKT2	*BLM*	*CDKN2B*	*EP300*	*FGF23*	*GNA11*	*JAK2*	*MCL1*	*NOTCH3*	*PMS2*	*ROS1*	*STAG2*	*WEE1*
AKT3	*BMX*	*CDKN2C*	*EPHA2*	*FGF3*	*GNA13*	*JAK3*	*MDM2*	*NPM1*	*POLD1*	*RPTOR*	*STAT3*	*WEE2*
ALK	*BRAF*	*CEBPA*	*EPHA3*	*FGF4*	*GNAQ*	*JUN*	*MDM4*	*NRAS*	*POLE*	*RUNX1*	*STAT4*	*WISP3*
AMER1	*BRCA1*	*CHD2*	*EPHA5*	*FGF6*	*GNAS*	*KAT6A*	*MED12*	*NRG1*	*PPP2R1A*	*RUNX1T1*	*STK11*	*WT1*
APC	*BRCA2*	*CHD4*	*EPHA7*	*FGFR1*	*GPR124*	*KDM5A*	*MEF2B*	*NRG3*	*PRDM1*	*RXRA*	*STK24*	*XIAP*
AR	*BRD4*	*CHEK1*	*EPHB1*	*FGFR2*	*GRIN2A*	*KDM5C*	*MEN1*	*NSD1*	*PREX2*	*SDHA*	*SUFU*	*XPO1*
ARAF	*BRIP1*	*CHEK2*	*ERBB2*	*FGFR3*	*GRM3*	*KDM6A*	*MET*	*NTRK1*	*PRKAR1A*	*SDHB*	*SYK*	*YES1*
ARFRP1	*BTG1*	*CIC*	*ERBB3*	*FGFR4*	*GSK3B*	*KDR*	*MITF*	*NTRK2*	*PRKCI*	*SDHC*	*TAF1*	*ZBTB2*
ARID1A	*BTK*	*CRBN*	*ERBB4*	*FGR*	*H3F3A*	*KEAP1*	*MLH1*	*NTRK3*	*PRKDC*	*SDHD*	*TBX3*	*ZNF217*
ARID1B	*C11orf30*	*CREBBP*	*ERCC1*	*FH*	*HCK*	*KEL*	*MPL*	*NUP93*	*PRSS8*	*SETD2*	*TCF7L2*	*ZNF703*
ARID2	*CARD11*	*CRKL*	*ERG*	*FLCN*	*HGF*	*KIT*	*MRE11A*	*PAK3*	*PTCH1*	*SF3B1*	*TEK*	*ZNF750*
ASXL1	*CBFB*	*CRLF2*	*ERRFI1*	*FLT1*	*HNF1A*	*KLHL6*	*MS4A1*	*PALB2*	*PTEN*	*SIK1*	*TET2*	
ATM	*CBL*	*CSF1R*	*ESR1*	*FLT3*	*HRAS*	*KMT2A*	*MSH2*	*PARK2*	*PTK2*	*SLIT2*	*TGFBR 1*	
ATR	*CCND1*	*CSK*	*EZH2*	*FLT4*	*HSD3B1*	*KMT2C*	*MSH6*	*PAX5*	*PTK6*	*SMAD2*	*TGFBR 2*	
ATRX	*CCND2*	*CSNK1A1*	*FAM135B*	*FOXL2*	*HSP90AA1*	*KMT2D*	*MST1R*	*PBRM1*	*PTPN11*	*SMAD3*	*TIE1*	
AURKA	*CCND3*	*CTCF*	*FAM46C*	*FOXP1*	*IDH1*	*KRAS*	*MTOR*	*PDCD1LG 2*	*QKI*	*SMAD4*	*TNFAIP 3*	
AURKB	*CCNE1*	*CTNNA1*	*FANCA*	*FRS2*	*IDH2*	*LCK*	*MUTYH*	*PDGFRA*	*RAC1*	*SMARCA4*	*TNFRSF 14*	
AXIN1	*CD274*	*CTNNB1*	*FANCC*	*FUBP1*	*IGF1R*	*LIMK1*	*MYC*	*PDGFRB*	*RAD50*	*SMARCB1*	*TNFSF1 1*	
AXL	*CD79A*	*CUL3*	*FANCD2*	*FYN*	*IGF2*	*LMO1*	*MYCL*	*PDK1*	*RAD51*	*SMO*	*TNK2*	
BAP1	*CD79B*	*CXCR4*	*FANCE*	*GABRA 6*	*IKBKE*	*LRP1*	*MYCN*	*PIK3C2B*	*RAF1*	*SNCAIP*	*TOP1*	
BARD1	*CDC73*	*CYLD*	*FANCF*	*GATA1*	*IKZF1*	*LRP1B*	*MYD88*	*PIK3CA*	*RANBP2*	*SOCS1*	*TOP2A*	
BCL2	*CDH1*	*DAXX*	*FANCG*	*GATA2*	*IL7R*	*LYN*	*NEK11*	*PIK3CB*	*RARA*	*SOX10*	*TP53*	
BCL2L1	*CDK12*	*DDR1*	*FANCL*	*GATA3*	*INHBA*	*LZTR1*	*NF1*	*PIK3CD*	*RB1*	*SOX2*	*TSC1*	

Gene fusion												
ALK	*BCR*	*BRAF*	*BRCA1*	*BRCA2*	*BRD4*	*ETV1*	*ETV4*	*ETV5*	*ETV6*	*FGFR1*	*FGFR2*	*FGFR3*
MYB	*NOTCH2*	*NTRK1*	*NTRK2*	*PDGFR A*	*RAF1*	*RARA*	*RET*	*ROS1*	*TMPRSS2*	*MET*	*DDR2*	