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SUPPLEMENTAL DATA

Preoperative neutrophil-to-lymphocyte ratio and overall survival after biliary tract cancer resection: A retrospective cohort study

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Table S1. Missing data patterns

Age	Gender	Tumor Location	Tumor differentiation	Tumor size	T stage	N stage	Adjuvant therapy	*n*	No. of missing variables
1	1	1	1	1	1	1	1	55	0
1	1	1	0	1	1	0	0	0	3
1	1	1	1	1	1	0	0	13	2
1	1	1	0	1	1	0	1	7	2
1	1	1	0	1	1	1	0	0	2
1	1	1	0	1	1	1	1	4	1
1	1	1	1	1	1	0	1	13	1
1	1	1	1	1	1	1	0	17	1

1 = non-missing; 0 = missing.

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Table S2. AUC of inflammatory factors

Inflammatory factor	AUC 95% CI	Cut-off value	Sensitivity (%)	Specificity (%)	Youden index	*p* value
NLR	0.631 (0.519-0.743)	2.11	90.0	38.5	0.285	Reference
PLR	0.501 (0.387-0.614)	132.66	75.7	35.9	0.116	0.031
dNLR	0.647 (0.538-0.755)	1.75	67.1	59.0	0.261	0.392
LMR	0.472 (0.357-0.587)	5.94	5.7	100	0.057	0.017

The *p* value obtained by comparing each inflammatory factor with NLR. **Abbreviations**: AUC, area under the curve; CI, confidence interval; dNLR, derived neutrophil-to-lymphocyte ratio; LMR, lymphocyte-to-monocyte ratio; NLR, neutrophil-to-lymphocyte ratio; PLR, platelet-to-lymphocyte ratio.

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Table S3. Relationship between preoperative inflammatory factors level and clinical characteristics

Characteristics	Parameter	NLR			PLR			dNLR			LMR		
		High *n*/N (%)	Low *n*/N (%)	*p* value	High *n*/N (%)	Low *n*/N (%)	*p* value	High *n*/N (%)	Low *n*/N (%)	*p* value	High *n*/N (%)	Low *n*/N (%)	*p* value
Gender *n*=109	Male	44/109 (41)	13/109 (12)	0.475*	38/109 (35)	19/109 (17)	0.236*	27/109 (25)	30/109 (27)	0.012*	1/109 (1)	56/109 (51)	0.346#
	Female	43/109 (39)	9/109 (8)		40/109 (37)	12/109 (11)		37/109 (34)	15/109 (14)		3/109 (3)	49/109 (45)	
Age（y） *n*=109	≥ 61	44/109 (41)	11/109 (10)	0.962*	38/109 (35)	17/109 (16)	0.564*	33/109(30)	22/109 (20)	0.783*	3/109 (3)	52/109 (48)	0.618#
	< 61	43/109 (39)	11/109 (10)		40/109 (37)	14/109 (12)		31/109 (28)	23/109 (22)		1/109 (1)	53/109 (48)	
Tumor differentiation *n*=98	High	9/98 (9)	4/98 (4)	0.720#	10/98 (10)	3/98 (3)	0.374#	8/98 (8)	5/98 (5)	0.947*	0/98 (0)	13/98 (13)	1#
	Moderate	48/98 (49)	12/98 (12)		45/98 (45)	15/98 (16)		35/98 (36)	25/98 (26)		3/98 (3)	57/98 (58)	
	Poor	20/98 (21)	5/98 (5)		15/98 (16)	10/98 (10)		14/98 (14)	11/98 (11)		1/98 (1)	24/98 (25)	

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Tumor location *n*=109	Gallbladder	29/109 (27)	10/109 (9)	0.456*	23/109 (21)	16/109 (15)	0.091*	23 (21)	16 (14)	0.478*	2/109 (2)	37/109 (34)	0.545#
	Intrahepatic bile duct	30/109 (28)	5/109 (4)		28/109 (26)	7/109 (6)		23/109 (21)	12/109 (11)		0/109 (0)	35/109 (32)	
	Extrahepatic bile duct	28/109 (26)	7/109 (6)		27/109 (25)	8/109 (7)		18/109 (17)	17/109 (16)		2/109 (2)	33/109 (30)	
Tumor size *n*=109	≥3.5cm	47/109 (43)	10/109 (9)	0.054*	41/109 (38)	16/109 (15)	0.929*	39/109 (36)	18/109 (17)	0.031*	3/109 (3)	54/109 (50)	0.620#
	<3.5cm	40/109 (37)	12/109 (11)		37/109 (34)	15/109 (13)		25/109 (23)	27/109 (24)		1/109 (1)	51/109 (46)	
T stage *n*=106	T1-2	41/106 (39)	16/106 (15)	0.045*	42/106 (40)	15/106 (14)	0.475*	32/106 (30)	25/106 (24)	0.596*	1/106 (1)	56/106 (53)	0.334#
	T3-4	43/106 (41)	6/106 (5)		33/106 (31)	16/106 (15)		30/106 (28)	19/106 (18)		3/106 (3)	46/106 (43)	
N stage *n*=77	N-	38/77 (49)	9/77 (12)	0.659*	32/77 (42)	15/77 (19)	0.416*	30/77 (39)	17/77 (22)	0.530*	2/77 (3)	45/77 (58)	0.641#
	N+	23/77 (30)	7/77 (9)		23/77 (30)	7/77 (9)		17/77 (22)	13/77 (17)		2/77 (3)	28/77 (36)	

The LMR high group included only four patients, so results should be interpreted cautiously. *, *p* value for Chi-squared test; #, *p* value for Fisher's exact test. Percentages were calculated based on the number of patients with available data. Missing or unevaluable cases

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were excluded from the denominator for their respective variables. Denominators vary according to data availability. **Abbreviations**: dNLR, derived neutrophil-to-lymphocyte ratio; LMR, lymphocyte-to-monocyte ratio; N, regional lymph node status; N−, absence of regional lymph node metastasis; N+, presence of regional lymph node metastasis; NLR, neutrophil-to-lymphocyte ratio; PLR, platelet-to-lymphocyte ratio; T, primary tumor stage.

Table S4. Univariable and multivariable Cox regression analysis of overall survival (NLR, dNLR, PLR, and LMR as continuous variables)

Characteristics	Parameter	Univariate analysis		Multivariate analysis			
				Model A		Model B	
		HR（95%CI）	*p* value	HR（95%CI）	*p* value	HR（95%CI）	*p* value
Gender	Male	0.914(0.569-1.469)	0.710				
	Female						
Age（y)	< 61	1.227(0.767-1.963)	0.394				
	≥ 61						
Tumor differentiation	High	Reference	0.327				
	Moderate	1.424(0.716-2.833)					
	Poor	1.881(0.839-4.219)					
	Unclear						
Tumor location	Gallbladder	Reference	0.046	1.039(0.672-1.609)	0.862	1.034(0.669-1.596)	0.881

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	Intrahepatic bile duct	1.415(0.773-2.591)					
	Extrahepatic bile duct	0.685(0.396-1.187)					
Tumor size	<3.5cm	1.647(1.025-2.647)	0.039	0.773(0.369-1.619)	0.495	0.782(0.372-1.641)	0.515
	≥3.5cm						
T stage	T1-2	1.910(1.169-3.119)	0.010	1.737(0.827-3.648)	0.145	1.746(0.830-3.674)	0.142
	T3-4						
	Tx						
N stage	N-	1.858(1.013-3.408)	0.046	1.328(0.618-2.855)	0.467	1.228(0.561-2.688)	0.608
	N+						
	Nx						
Adjuvant therapy	Yes	1.906(1.055-3.443)	0.033	2.055(0.914-4.618)	0.081	2.100(0.938-4.703)	0.071
	No						
	Unclear						
NLR	Median 2.940	1.128(1.015-1.254)	0.025	1.131(0.961-1.332)	0.138		
	IQRs(2.255-4.183)						
PLR	Median 155.955	1.001(0.998-1.005)	0.469				

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	IQRs(128.620-221.308)					
dNLR	Median 1.960	1.318(1.084-1.602)	0.006		1.317(0.962-1.803)	0.085
	IQRs(1.470-2.625)					
LMR	Median 2.550	0.949(0.790-1.139)	0.573			
	IQRs(1.985-3.540)					

Abbreviations**:** CI, confidence interval; dNLR, derived neutrophil-to-lymphocyte ratio; HR, hazard ratio; IQRs, interquartile ranges; LMR, lymphocyte-to-monocyte ratio; N, regional lymph node status; N−, absence of regional lymph node metastasis; N+, presence of regional lymph node metastasis; NLR, neutrophil-to-lymphocyte ratio; Nx, regional lymph nodes cannot be assessed; PLR, platelet-to-lymphocyte ratio; T, primary tumor stage; Tx, primary tumor cannot be assessed.

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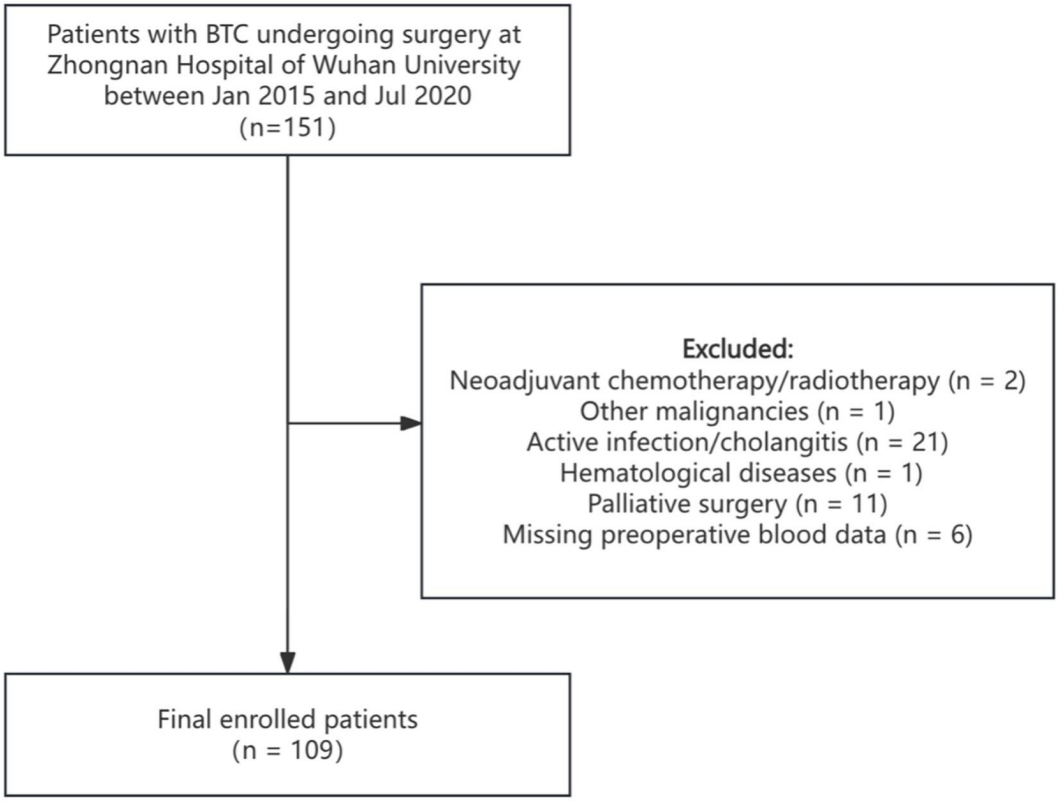


Figure S1. Patient selection flow diagram. Abbreviation: BTC, biliary tract cancer.

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