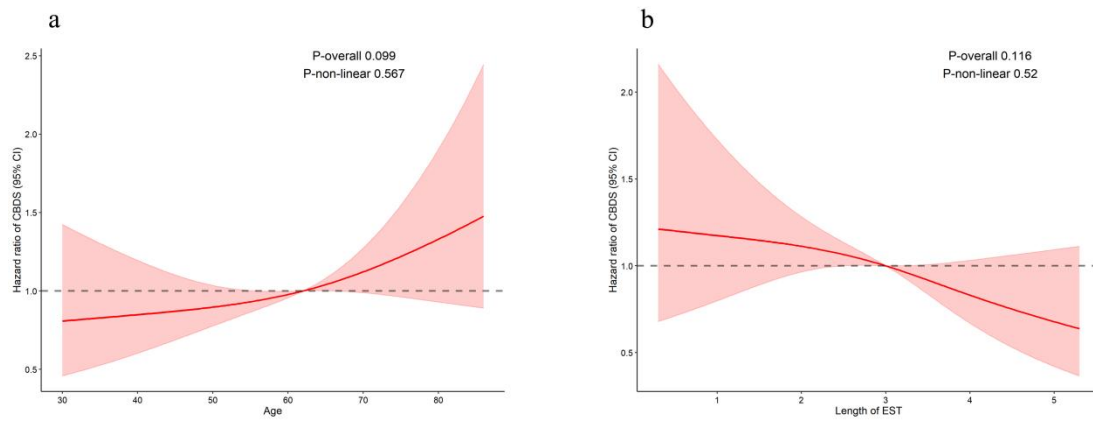
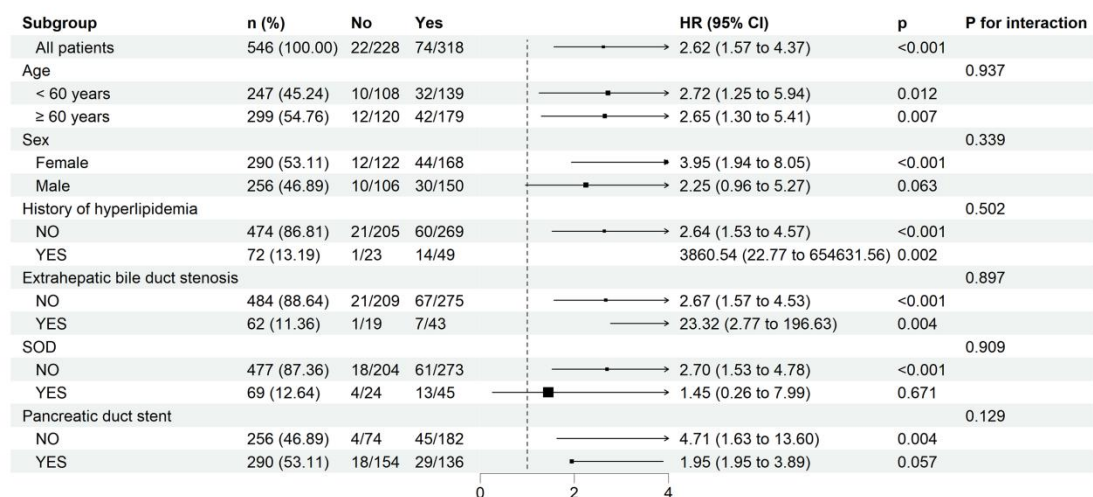
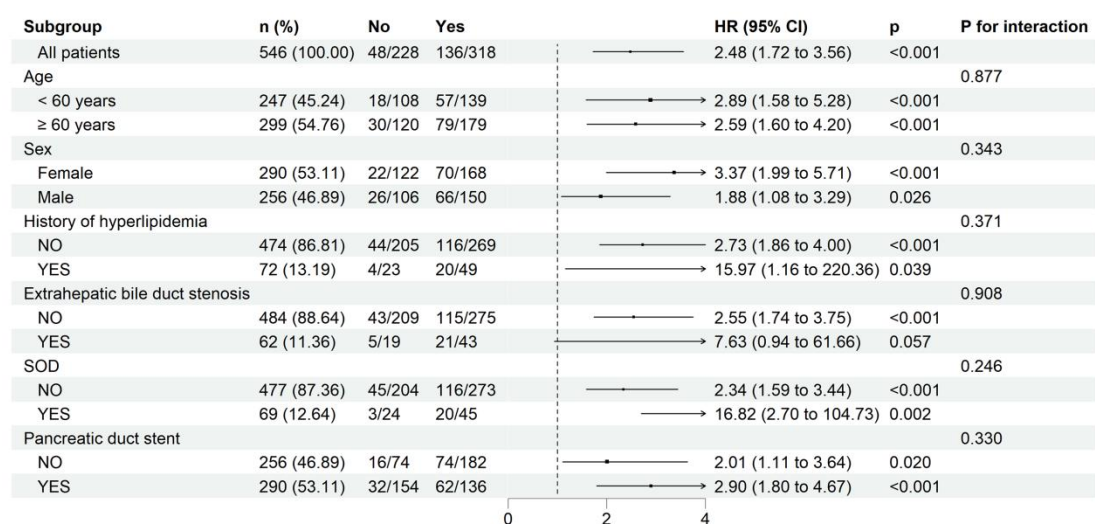




Supplementary Figure 1 Restricted cubic spline.



Supplementary Figure 2 Hazard ratios and 95% confidence intervals of chyme reflux into the bile duct according to types of biliary stents in study subgroups.



Supplementary Figure 3 Hazard ratios and 95% confidence intervals of CBDS according to Types of Biliary Stents in study subgroups.

Supplementary Table 1 Evaluation of postoperative safety following intro-biliary cleansing, *n* (%)

Variables	Total (<i>n</i> = 546)	SPBSG (<i>n</i> = 228)	DBBSG (<i>n</i> = 318)	<i>P</i>
Hyperamylasemia				0.113
No	492 (90.11)	200 (87.72)	292 (91.82)	
Yes	54 (9.89)	28 (12.28)	26 (8.18)	
Nausea and vomiting				0.214
No	524 (95.97)	216 (94.74)	308 (96.86)	
Yes	22 (4.03)	12 (5.26)	10 (3.14)	
Hospitalization duration				0.039
≤ 1 day	232 (42.49)	105 (46.05)	127 (39.94)	
2 days	137 (25.09)	64 (28.07)	73 (22.96)	
3 days	82 (15.02)	30 (13.16)	52 (16.35)	
≥ 4 days	95 (17.40)	29 (12.72)	66 (20.75)	
ALT, M (Q ₁ , Q ₃)	26.00 (18.00, 45.38)	26.00 (17.75, 42.25)	26.15 (18.00, 49.98)	0.278
AST, M (Q ₁ , Q ₃)	28.10 (22.80, 41.88)	27.90 (22.65, 38.30)	28.45 (23.02, 44.42)	0.341
γ-GGT, M (Q ₁ , Q ₃)	32.85 (18.62, 86.25)	27.65 (16.75, 77.47)	36.85 (20.55, 98.05)	0.009
ALP, M (Q ₁ , Q ₃)	79.50 (64.70, 108.93)	77.40 (63.68, 98.47)	82.65 (65.05, 115.28)	0.106
Amylase, M (Q ₁ , Q ₃)	98.45 (80.10, 129.73)	98.95 (82.07, 140.35)	97.00 (77.55, 127.95)	0.166
WBC, M (Q ₁ , Q ₃)	6.46 (5.15, 8.03)	6.45 (5.05, 8.29)	6.48 (5.30, 7.76)	0.854
ANC, M (Q ₁ , Q ₃)	4.35 (3.18, 5.96)	4.36 (3.07, 5.95)	4.33 (3.24, 5.97)	0.747

ALT: Alanine aminotransferase; AST: Aspartate aminotransferase; γ-GGT: γ-glutamyl transpeptidase; ALP: Alkaline phosphatase; WBC: White blood cell count; ANC: Absolute neutrophil count.

Supplementary Table 2 Sensitivity analysis of the chyme reflux into the bile duct after excluding patients with SOD

Group	Model 1		Model 2		Model 3	
	HR (95%CI)	<i>P</i>	HR (95%CI)	<i>P</i>	HR (95%CI)	<i>P</i>
0	1.00 (reference)	-	1.00 (reference)	-	1.00 (reference)	-
1	2.688 (1.588-4.549)	< 0.001	2.895 (1.704-4.919)	< 0.001	2.834(1.632-4.918)	< 0.001

Model 1: Model 1 was unadjusted; model 2: Model 2 was based on model 1 and additionally adjusted for age, sex, PBM and extrahepatic bile duct stricture; model 3: Model 3 was based on model 2 and further adjusted for duodenal papilla length, length of EST, DP, metal-covered biliary stents and PDS.

Supplementary Table 3 Sensitivity analysis of the chyme reflux into the bile duct after excluding patients with Metal-covered biliary stents

Group	Model 1		Model 2		Model 3	
	HR (95%CI)	<i>P</i>	HR (95%CI)	<i>P</i>	HR (95%CI)	<i>P</i>
0	1.00 (reference)	-	1.00 (reference)	-	1.00 (reference)	-
1	2.761 (1.700-4.484)	< 0.001	2.982 (1.827-4.867)	< 0.001	2.883 (1.735-4.790)	< 0.001

Model 1: Model 1 was unadjusted; model 2: Model 2 was based on model 1 and additionally adjusted for age, sex, PBM and extrahepatic bile duct stricture; model 3: Model 3 was based on model 2 and further adjusted for duodenal papilla length, length of EST, DP, SOD and PDS.

Supplementary Table 4 Sensitivity analysis of the CBDS after excluding patients with SOD

Group	Model 1		Model 2		Model 3	
	HR (95%CI)	<i>P</i>	HR (95%CI)	<i>P</i>	HR (95%CI)	<i>P</i>
0	1.00 (reference)	-	1.00 (reference)	-	1.00 (reference)	-
1	2.125 (1.501-3.008)	< 0.001	2.136 (1.506-3.031)	< 0.001	2.204 (1.514-3.208)	< 0.001

Model 1: Model 1 was unadjusted; model 2: Model 2 was based on model 1 and additionally adjusted for age, sex, PBM and extrahepatic bile duct stricture; model 3: Model 3 was based on model 2 and further adjusted for Duodenal papilla length, Length of EST, DP, Metal-covered biliary stents and PDS.

Supplementary Table 5 Sensitivity analysis of the CBDS after excluding patients with metal-covered biliary stents

Group	Model 1		Model 2		Model 3	
	HR (95%CI)	<i>P</i>	HR (95%CI)	<i>P</i>	HR (95%CI)	<i>P</i>
0	1.00 (reference)	-	1.00 (reference)	-	1.00 (reference)	-
1	2.280 (1.624-3.201)	< 0.001	2.257 (1.605-3.173)	< 0.001	2.361 (1.647-3.384)	< 0.001

Model 1: Model 1 was unadjusted; Model 2: Model 2 was based on model 1 and additionally adjusted for age, sex, PBM and extrahepatic bile duct stricture; Model 3: Model 3 was based on model 2 and further adjusted for duodenal papilla length, length of EST, DP, SOD Diameter of the stents and PDS.