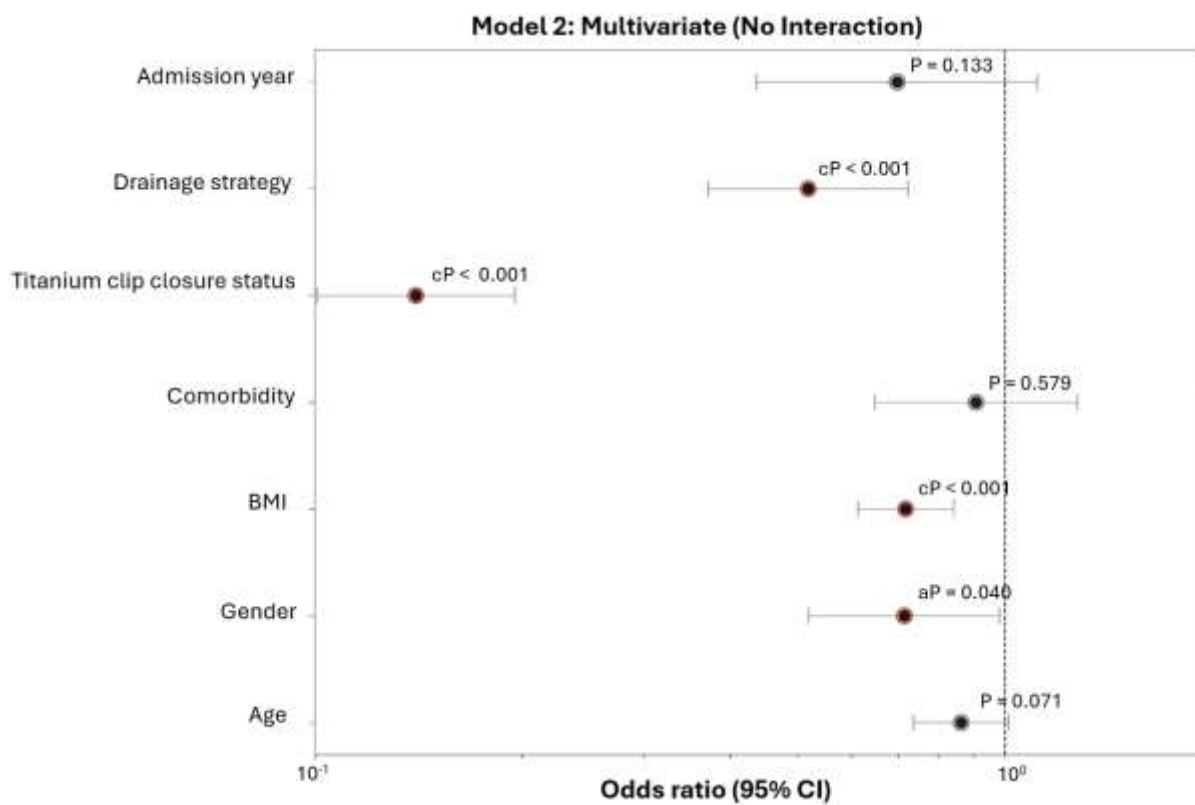
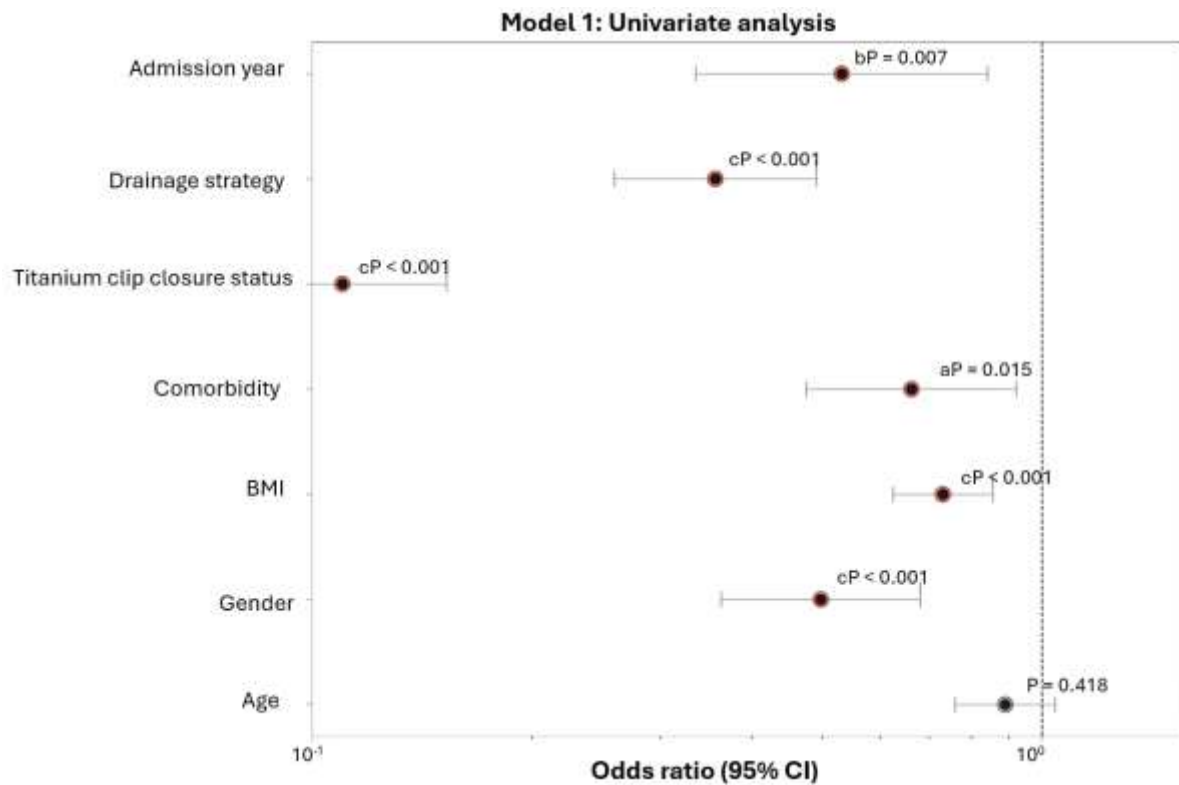
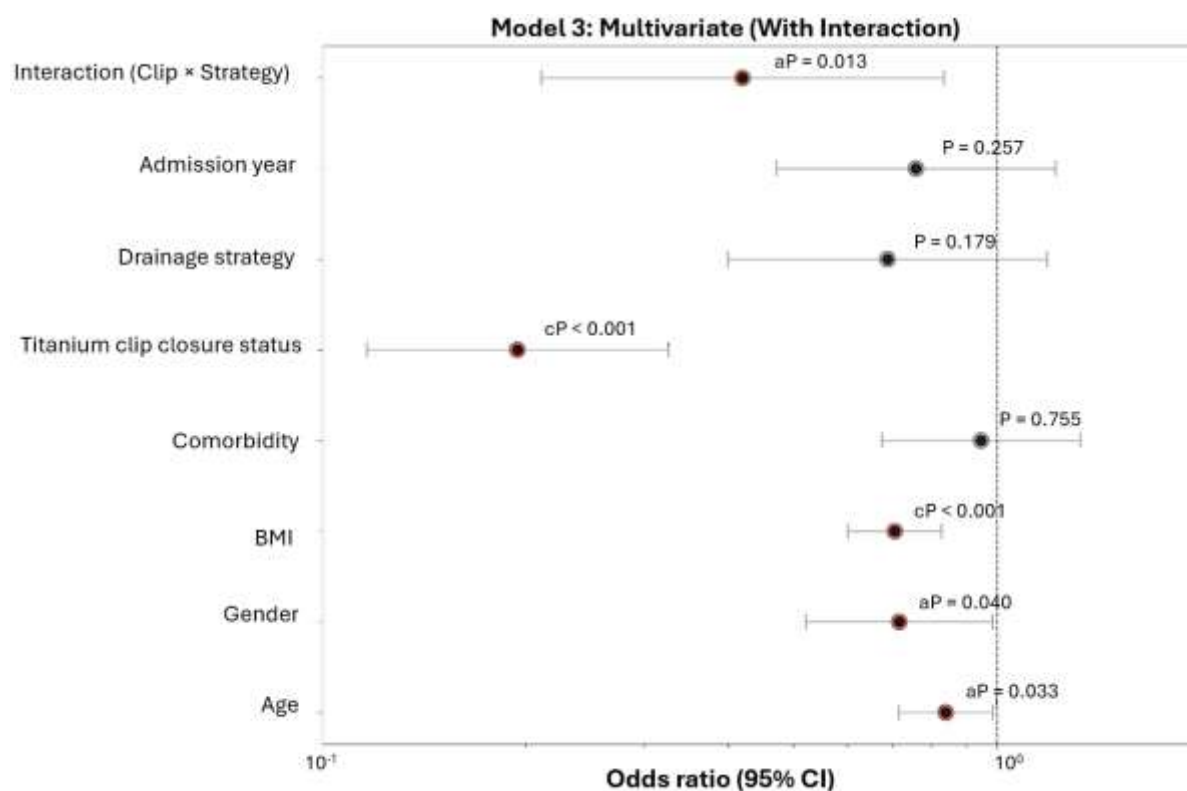
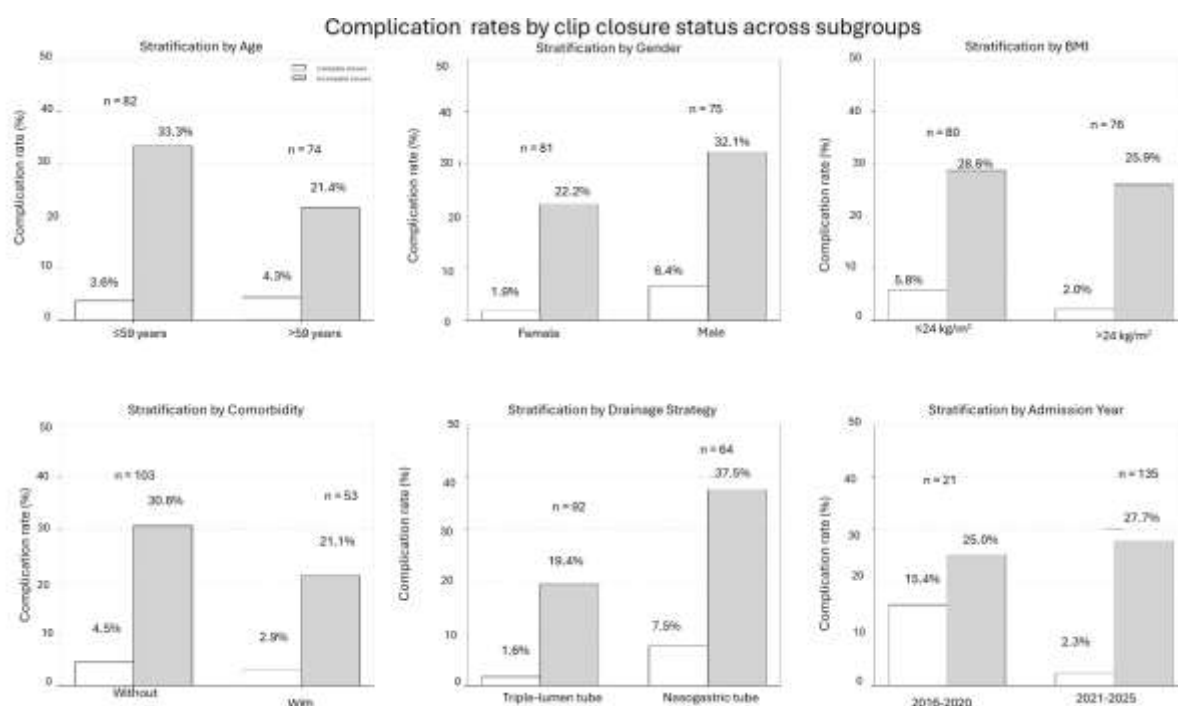


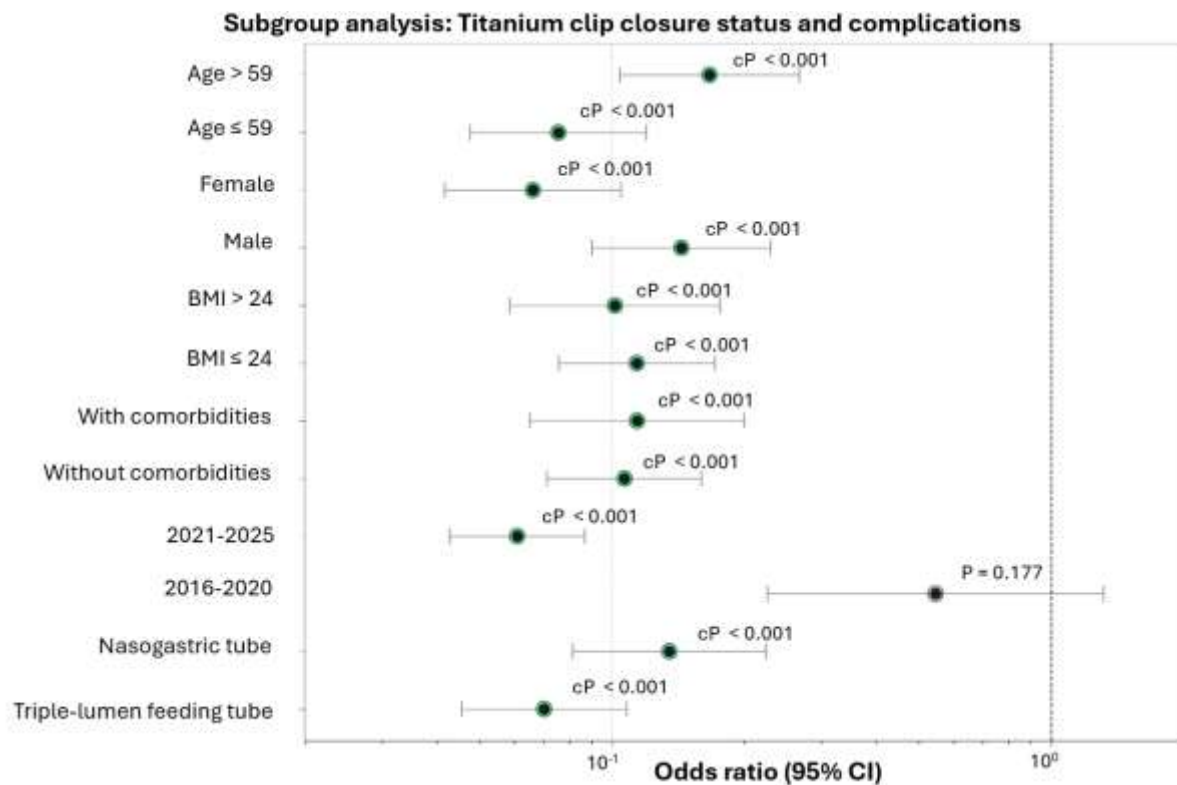




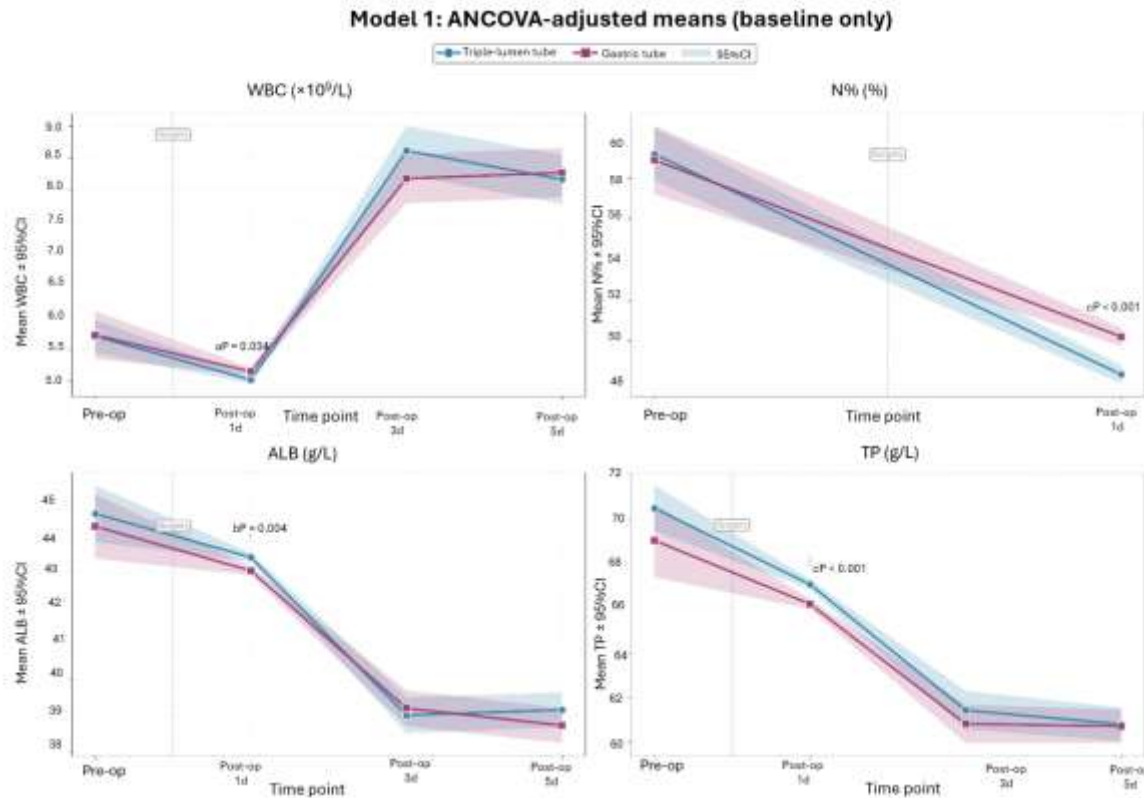
Supplementary Figure 1 Forest plot of univariate and multivariate logistic regression for delayed AEs following duodenal ESD. 95%CI: 95% confidence interval; AEs: adverse effects; ESD: Endoscopic submucosal dissection. aP indicates $P < 0.05$, bP indicates $P < 0.01$, cP indicates $P < 0.001$.



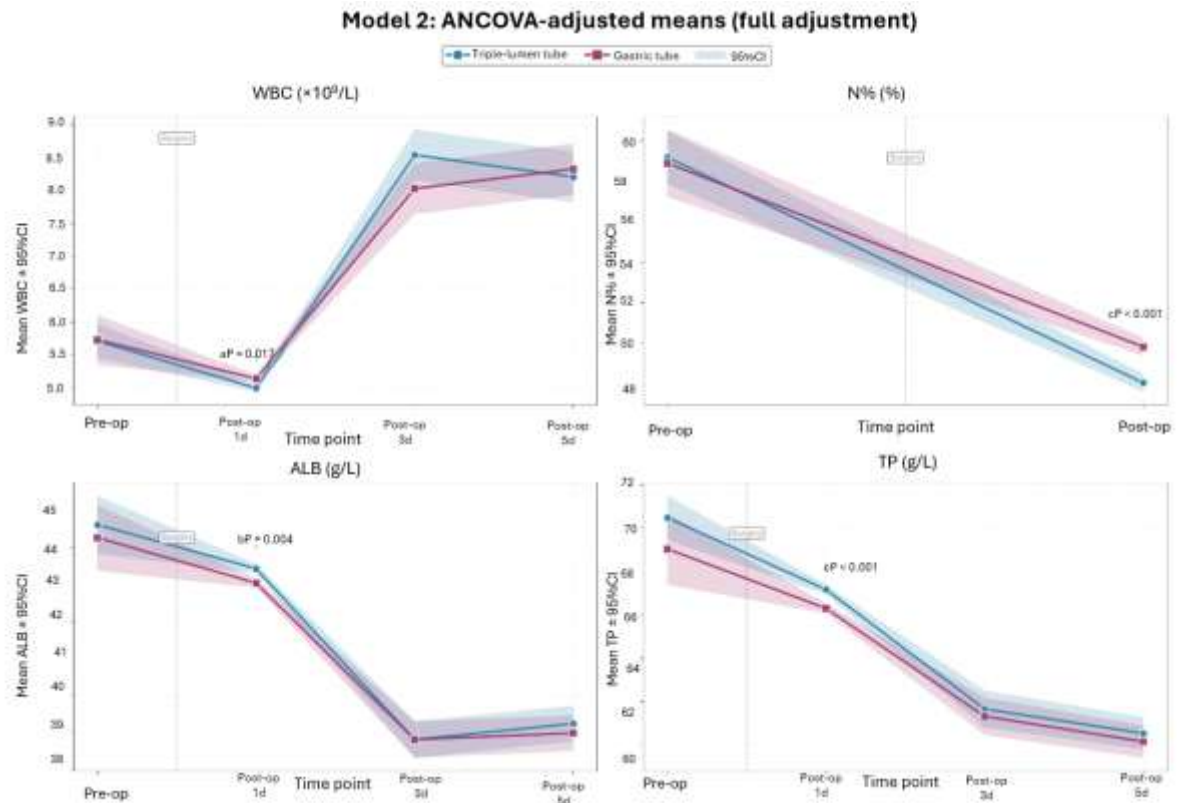
Supplementary Figure 2 Subgroup χ^2 analyses of the association between titanium clip closure quality and postoperative complications after duodenal ESD.
ESD: Endoscopic submucosal dissection.



Supplementary Figure 3 Subgroup logistic regression forest plot of titanium clip closure quality and postoperative complications following duodenal ESD. 95%CI: 95% confidence interval; BMI: Body mass index; ESD: Endoscopic submucosal dissection; OR: Odds ratio. cP indicates $P < 0.001$.



Supplementary Figure 4 Associations between postoperative drainage methods and inflammatory and nutritional indicators following duodenal ESD (Model 1). 95%CI: 95% confidence interval; ALB: Albumin; ANCOVA: Analysis of covariance; ESD: Endoscopic submucosal dissection; N%: Neutrophil percentage; TP: Total protein. aP indicates $P < 0.05$, bP indicates $P < 0.01$, cP indicates $P < 0.001$.



Supplementary Figure 5 Associations between postoperative drainage methods and inflammatory and nutritional indicators following duodenal ESD (Model 2). 95%CI: 95% confidence interval; ALB: Albumin; ANCOVA: Analysis of covariance; ESD: Endoscopic submucosal dissection; N%: Neutrophil percentage; TP: Total protein. aP indicates $P < 0.05$, bP indicates $P < 0.01$, cP indicates $P < 0.001$

Supplementary Table 1 Baseline characteristics of patients grouped by complications

Variable	Complication -free Group (<i>n</i> = 137)	Complication Group (<i>n</i> = 19)	<i>t</i> / χ^2	<i>P</i>
Age (years)	58.80 ± 11.34	57.47 ± 12.98	0.425	0.675
Gender				
Male	63 (45.99%)	12 (63.16%)	1.343	0.247
Female	74 (54.01%)	7 (36.84%)		
BMI (kg/m ²)	24.29 ± 3.47	23.42 ± 2.77	1.244	0.225
Hypertension				
Yes	34 (24.82%)	3 (15.79%)	0.336	0.567
No	103 (75.18%)	16 (84.21%)		
Diabetes				
Yes	19 (13.87%)	1 (5.26%)	0.470	0.471
No	118 (86.13%)	18 (94.74%)		
Coronary heart disease				
Yes	12 (8.76%)	1 (5.26%)	0.005	1.000
No	125 (91.24%)	18 (94.74%)		
Admission year				
2016-2020	17 (12.41%)	4 (21.05%)	0.457	0.291
2021-2025	120 (87.59%)	15(78.95%)		
Titanium clip closure status			15.979	<0.001
Complete	97 (70.80%)	4 (21.05%)		
Incomplete	40 (29.20%)	15 (78.95%)		
Drainage strategy				
Triple-lumen feeding tube	85(62.04%)	7(36.84%)	3.401	0.065
Nasogastric tube	52(37.96%)	12(63.16%)		

BMI: Body mass index.

Supplementary Table 2 Univariate and multivariable logistic regression and interaction analyses of the factors associated with delayed AEs after duodenal ESD

Variable		Model 1		Model 2		Model 3	
		OR (95%CI)	<i>P</i>	OR (95%CI)	<i>P</i>	OR (95%CI)	<i>P</i>
Age (per 1 SD increase)	—	0.89 (0.76, 1.04)	0.148	0.86 (0.74, 1.01)	0.071	0.84 (0.72, 0.99)	0.033
BMI (per 1 SD increase)	—	0.73 (0.63, 0.86)	<0.001	0.72 (0.61, 0.84)	<0.001	0.71 (0.60, 0.83)	<0.001
Gender	Male (reference)	1	<0.001	1	0.040	1	0.040
	Female	0.50 (0.36, 0.68)		0.72 (0.52, 0.98)		0.72 (0.52, 0.99)	
Comorbidity	Without (reference)	1	0.015	1	0.579	1	0.755
	With	0.66 (0.48, 0.92)		0.91 (0.65, 1.27)		0.95 (0.68, 1.33)	
Admission year	2016–2020	1	0.007	1	0.133	1	0.257
	2021–2025	0.53 (0.34, 0.84)		0.70 (0.44, 1.12)		0.76 (0.47, 1.22)	
Titanium clip	Incomplete	1	<0.001	1	<0.001	1	<0.001

closure	(reference)		1		1		1
status	Complete	0.11		0.14		0.19	
		(0.08,		(0.10,		(0.12,	
		0.15)		0.20)		0.33)	
Drainage	Nasogastric	1	<0.00	1	<0.00	1	0.179
strategy	tube		1		1		
	(reference)						
	Triple-lume	0.36		0.52		0.69	
	n feeding	(0.26,		(0.37,		(0.40,	
	tube	0.49)		0.72)		1.19)	
Interaction:	—	—	—	—	—	0.42	0.013
TCCS × DS						(0.21,	
						0.83)	

95%CI: 95% confidence interval; BMI: body mass index; OR: odds ratio; SD: standard deviation; TCCS: titanium clip closure status; DS: drainage strategy; × indicates interaction

Supplementary Table 3 Subgroup χ^2 analyses of the association between titanium clip closure quality and postoperative complications after duodenal ESD

Stratification Variable	Subgroup	Sample Size (n)	Complete Closure Complication Rate (%)	Incomplete Closure Complication Rate (%)	RR	P
					R	(%)
Age (years)	>59	74	4.3 (2/46)	21.4 (6/28)	80.0	0.047
	≤59	82	3.6 (2/55)	33.3 (9/27)	89.2	<0.001
Gender	Male	75	6.4 (3/47)	32.1 (9/28)	80.1	0.007
	Female	81	1.9 (1/54)	22.2 (6/27)	91.4	0.005
BMI (kg/m ²)	>24.0	76	2.0 (1/49)	25.9 (7/27)	92.3	0.002

	≤24.0	80	5.8 (3/52)	28.6 (8/28)	80.0	0.013
Comorbidity	No	103	4.5 (3/67)	30.6 (11/36)	85.3	<0.001
	Yes	53	2.9 (1/34)	21.1 (4/19)	86.3	0.050
Drainage	Nasogastric	74	4.3 (2/46)	21.4 (6/28)	80.0	0.006
strategy	tube					
	Triple-lumen feeding tube	82	3.6 (2/55)	33.3 (9/27)	89.2	<0.005
Admission	2016–2020	21	15.4 (2/13)	25.0 (2/8)	38.4	0.618
year	2021–2025	135	2.3 (2/88)	27.7 (13/47)	91.7	<0.001

BMI: Body mass index; RRR: relative risk reduction.

Supplementary Table 4 Subgroup logistic regression analyses of the association between titanium clip closure quality and postoperative complications after duodenal ESD

Stratified Variable	Subgroup	<i>N</i>	<i>n</i>	OR (95%CI)	<i>P</i>
Age (years)	>59	74	8	0.17 (0.10, 0.27)	<0.001
	≤59	82	11	0.08 (0.05, 0.12)	<0.001
Gender	Male	75	12	0.14 (0.09, 0.23)	<0.001
	Female	81	7	0.07 (0.04, 0.10)	<0.001
BMI (kg/m ²)	> 24	57	5	0.10 (0.06, 0.18)	<0.001

	≤24	99	14	0.11	(0.08, <0.001 0.17)
Admission year	2016–2020	21	4	0.55	(0.23, 0.177 1.32)
	2021–2025	135	15	0.06	(0.04, <0.001 0.09)
Comorbidity	Without	103	14	0.11	(0.07, <0.001 0.16)
	With	53	5	0.11	(0.07, <0.001 0.20)
Drainage strategy	Triple-lumen feeding tube	92	7	0.07	(0.05, <0.001 0.11)
	Nasogastric tube	64	12	0.14	(0.08, <0.001 0.22)

95%CI: 95% confidence interval; BMI: body mass index; OR: odds ratio.

Supplementary Table 5 Associations between postoperative drainage methods and inflammatory and nutritional indicators following duodenal ESD

	Model 1				Model 2			
	<i>F</i>	<i>P</i>	AMD	<i>R</i> ²	<i>F</i>	<i>P</i>	AMD	<i>R</i> ²
WBC-P	4.58	0.034	-0.130	0.921	5.792	0.017	-0.140	0.927
OD1	5							
WBC-P	1.19	0.275	0.440	0.081	1.545	0.216	0.510	0.087
OD3	9							
WBC-P	0.06	0.793	-0.110	0.000	0.084	0.772	-0.120	0.001
OD5	9							
N%-PO	16.1	<0.001	-1.850	0.807	14.373	<0.001	-1.770	0.812
D1	86							

ALB-PO	8.51	0.004	0.370	0.959	8.715	0.004	0.390	0.959
D1	7							
ALB-PO	0.13	0.710	-0.190	0.054	0.000	0.999	0.000	0.088
D3	9							
ALB-PO	0.72	0.397	0.430	0.040	0.251	0.617	0.260	0.077
D5	3							
TP-POD	13.6	<0.001	0.880	0.943	12.328	<0.001	0.860	0.944
1	28							
TP-POD	0.45	0.501	0.610	0.012	0.132	0.717	0.330	0.034
3	5							
TP-POD	0.01	0.905	0.090	0.003	0.230	0.632	0.380	0.022
5	4							

ALB: Albumin; AMD: adjusted mean difference; BMI: body mass index; N%: neutrophil percentage; POD: postoperative day; TP: total protein.