Research Square

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Body size and restricted papillary exposure during pediatric ERCP with standard duodenoscopes: a retrospective cohort study

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Research Article

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Abstract

Background

Endoscopic retrograde cholangiopancreatography (ERCP) is used for biliary and pancreatic disorders in children, usually with standard therapeutic duodenoscopes. We examined whether body size was associated with papilla–scope apposition and whether apposition co-occurred with technical constraints or altered cannulation performance.

Methods

We retrospectively reviewed all consecutive ERCP procedures performed in patients younger than 18 years at Wuhan Children's Hospital between October 2020 and April 2026. Papilla–scope apposition was graded intra-procedurally as none, mild, moderate, or severe according to the visible space between the distal duodenoscope tip and the major papilla. The primary analysis included the first biliary-primary ERCP for each child. Body size and apposition were assessed using Spearman rank correlation. Working-space limitation and scope instability were compared by apposition status, and biliary cannulation outcomes were examined exploratorily.

Results

The cohort comprised 117 children undergoing 134 ERCP procedures; deep selective cannulation succeeded in 129/134 (96.3%). Eighty-three procedures were biliary-primary and arose from 82 children. In the primary analysis (n = 82), apposition was absent in 49 procedures, mild in 14, moderate in 9, and severe in 10. Median body weight decreased from 30.0 kg with no apposition to 11.0 kg with severe apposition, and weight was inversely associated with apposition grade ($\rho = -0.825$, $P < 0.001$). Limited working space occurred in 84.8% of procedures with apposition versus 4.1% without apposition ($P < 0.001$), and scope instability in 51.5% versus 18.4% ($P = 0.003$). Median cannulation time was 64 s with none/mild apposition and 121.5 s with moderate/severe apposition ($P = 0.115$). Cannulation time > 300 s or failed cannulation occurred in 20.6% and 36.8%, respectively (OR 2.24, 95% CI 0.74–6.84; $P = 0.221$).

Conclusions

Smaller body size was associated with greater papilla–scope apposition during pediatric biliary ERCP using standard duodenoscopes. Apposition was closely associated with limited working space and more frequent scope instability, while its relationship with cannulation performance remained uncertain.

Background

Endoscopic retrograde cholangiopancreatography (ERCP) is an established therapeutic option for selected biliary and pancreatic disorders in children. Pediatric series and meta-analyses have mainly described indications, technical success, and adverse events, with high rates of successful therapeutic intervention reported in experienced centers [1–7]. In contrast, the spatial relationship between the distal duodenoscope tip and the papilla during selective cannulation has received relatively little attention.

Body size remains a practical consideration because most pediatric ERCP procedures are performed with standard therapeutic duodenoscopes. Age and body weight are commonly considered when selecting the endoscope [8–11], and standard duodenoscopes are widely used in larger children. Therapeutic ERCP with standard scopes has also been shown to be feasible in smaller children, including selected infants [5, 12, 13]. Even when a standard scope is safely advanced, the relatively large diameter of the distal scope tip may reduce the working space around the papilla in smaller children and make stable en face positioning more difficult.

At our center, this spatial relationship was documented intra-procedurally as papilla–scope apposition using a four-grade scale based on the visible space between the distal scope tip and the papilla. We therefore examined the association between body size and papilla–scope apposition, its relationship with limited duodenal working space and scope instability, and its association with cannulation performance in biliary-primary procedures.

Methods

Study design and participants

We retrospectively reviewed all consecutive ERCP procedures performed in patients younger than 18 years at Wuhan Children's Hospital between 4 October 2020 and 14 April 2026. A total of 134 procedures in 117 children were identified, and all were included in the analysis. Procedure-level data were retrospectively extracted from the original medical records and ERCP operative records and compiled into a study dataset. Repeat procedures in the same child were identified using the research patient identifier. The ERCP procedure was the unit of data collection; the primary inferential analysis was restricted to the first biliary-primary ERCP for each child, as described below.

The Wuhan Children's Hospital Medical Ethics Committee approved the study (2024R032-E02). The requirement for informed consent was waived because of the retrospective study design and use of de-identified data.

Equipment and source data

All ERCP procedures were performed by three operators using standard Olympus JF-260V or TJF-260V duodenoscopes. The distal-end outer diameters of the JF-260V and TJF-260V were 12.6 and 13.5 mm, respectively, and both had an insertion-tube outer diameter of 11.3 mm. Dedicated pediatric

duodenoscopes were not available at our center during the study period. Duodenoscope model was abstracted from the operative records and categorized as JF or TJF for analysis.

Demographic variables, including age, sex, body weight, and height, were retrospectively abstracted from the medical records. Procedural variables were obtained from the contemporaneous ERCP operative records. Papilla–scope apposition, duodenal working-space limitation, and scope instability had been recorded by the operator at the time of the procedure. Cannulation success and cannulation time were also abstracted from the operative records. These data were compiled into the study dataset, and procedure date, diagnosis, therapeutic intervention, and duct-specific procedural intent were verified against the source records.

For duct-specific analyses, each procedure was classified according to its principal therapeutic target as biliary-primary, pancreatic-primary, or mixed/dual-duct. Procedures in which the principal therapeutic access and intervention were directed to the biliary or pancreatic duct were classified accordingly. Procedures involving substantive therapeutic interventions in both ducts, or in which a single primary duct could not be assigned, were classified as mixed/dual-duct. Temporary pancreatic guidewire placement or prophylactic pancreatic stent placement during a biliary procedure did not by itself alter the classification from biliary-primary.

Papilla–scope apposition and technical outcomes

Papilla–scope apposition was graded by the operator at the time of ERCP as none, mild, moderate, or severe according to the visible space between the distal tip of the duodenoscope and the major papilla. Higher grades indicated progressively less intervening space and more restricted en face exposure. Grading was visual and did not use a measured distance threshold.

Limited duodenal working space was recorded by the operator as present or absent during the procedure. Scope instability was recorded as present when scope slippage occurred at least twice during cannulation. Both variables were obtained from the contemporaneous ERCP operative records.

Cannulation success was defined as successful deep selective cannulation of the intended duct. Cannulation time was recorded in seconds from first papillary contact to successful deep cannulation. Because a completion time was not available for failed cannulation, continuous cannulation-time analyses included successful procedures only.

Analyses relating papilla–scope apposition to cannulation performance were restricted to biliary-primary procedures. In this group, an exploratory composite outcome was defined as successful cannulation requiring > 300 s or failed deep cannulation. The 300-s cutoff corresponded to the 5-min time component used in the European Society of Gastrointestinal Endoscopy definition of difficult biliary cannulation [14]. Because the recorded timing interval and the available procedural variables did not capture all components of the ESGE definition, this composite was not considered equivalent to ESGE-defined difficult biliary cannulation.

Statistical analysis

Continuous variables are presented as medians and interquartile ranges (IQRs), and categorical variables as counts and percentages. To ensure independence of observations, the primary analysis of body size and papilla–scope apposition was restricted to the first biliary-primary ERCP for each child. The association between body weight and the four-level apposition grade was assessed using Spearman rank correlation. Associations with age and height were examined separately as secondary measures of patient size.

Sensitivity analyses repeated the weight–apposition correlation using all biliary-primary procedures, including repeat procedures in the same child, and within each duodenoscope family. The co-occurrence of papilla–scope apposition with limited duodenal working space and scope instability was examined by comparing procedures with any apposition with those without apposition using Fisher's exact test.

Cannulation analyses were restricted to biliary-primary procedures because pancreatic-primary procedures represented a different procedural setting and mixed/dual-duct procedures did not have a single unambiguous target for comparison. Cannulation time among successfully cannulated procedures was compared between none/mild and moderate/severe apposition using the Mann–Whitney U test. The exploratory composite outcome of cannulation time > 300 s or failed deep cannulation was compared between these groups using an unadjusted odds ratio (OR) with a 95% confidence interval (CI) and Fisher's exact test. Body weight was compared between procedures with and without limited duodenal working space using the Mann–Whitney U test.

All tests were two-sided, with $P < 0.05$ considered statistically significant.

Results

Cohort characteristics

The 117 children underwent 134 ERCP procedures. Median age at the time of the procedure was 7.61 years (IQR 4.16–10.61), median body weight was 22.8 kg (IQR 15–36), and median height was 124 cm (IQR 103–146). Eighty procedures (59.7%) involved female patients. JF-260V duodenoscopes were used in 61 procedures and TJF-260V duodenoscopes in 73. Deep selective cannulation was successful in 129/134 procedures (96.3%) (Table 1).

Table 1
Cohort and procedural characteristics

Characteristic	Overall (n = 134 procedures)
Children, n	117
ERCP procedures, n	134
Age at procedure, years, median (IQR)	7.61 (4.16–10.61)
Procedures involving female patients, n (%)	80 (59.7)
Body weight, kg, median (IQR)	22.8 (15–36)
Height, cm, median (IQR)	124 (103–146)
Duodenoscope family	
JF-260V, n (%)	61 (45.5)
TJF-260V, n (%)	73 (54.5)
Procedural classification	
Biliary-primary, n (%)	83 (61.9)
Pancreatic-primary, n (%)	45 (33.6)
Mixed/dual-duct, n (%)	6 (4.5)
Deep selective cannulation success, n/N (%)	129/134 (96.3)

Values are presented at the procedure level unless otherwise indicated. ERCP, endoscopic retrograde cholangiopancreatography; IQR, interquartile range.

Review of the operative records classified 83 procedures as biliary-primary, 45 as pancreatic-primary, and 6 as mixed/dual-duct. Cannulation was successful in 81/83 biliary-primary procedures, 42/45 pancreatic-primary procedures, and all 6 mixed/dual-duct procedures.

Body size and papilla–scope apposition

Across all 134 procedures, papilla–scope apposition was absent in 98, mild in 17, moderate in 9, and severe in 10. All moderate and severe apposition events occurred in biliary-primary procedures. Among the six mixed/dual-duct procedures, apposition was absent in three and mild in three. No apposition was recorded in the 45 pancreatic-primary procedures.

The primary analysis was therefore restricted to the first biliary-primary ERCP for each child, comprising 82 independent procedures. Apposition was absent in 49 procedures, mild in 14, moderate in 9, and severe in 10. Median body weight was 30.0 kg (IQR 20.0–44.0) with no apposition, 14.8 kg (IQR 13.3–15.0) with mild apposition, 11.5 kg (IQR 11.0–13.5) with moderate apposition, and 11.0 kg (IQR 10.1–

11.8) with severe apposition. Body weight was inversely associated with apposition grade (Spearman ρ = −0.825, P < 0.001) (Table 2; Fig. 1). Apposition grade was also inversely associated with age (ρ = −0.854, P < 0.001) and height (ρ = −0.851, P < 0.001).

Table 2
Body size and intra-procedural technical features according to papilla–scope apposition grade in the primary population

Papilla–scope apposition	Procedures, n	Body weight, kg, median (IQR)	Age, years, median (IQR)	Height, cm, median (IQR)	Limited working space, n/N (%)	Scope instability, n/N (%)
None	49	30.0 (20.0–44.0)	8.47 (6.21–11.06)	130 (117–150)	2/49 (4.1)	9/49 (18.4)
Mild	14	14.8 (13.3–15.0)	3.82 (3.08–4.10)	100 (96.5–103)	11/14 (78.6)	8/14 (57.1)
Moderate	9	11.5 (11.0-13.5)	2.50 (2.31–2.51)	90 (88–92)	8/9 (88.9)	4/9 (44.4)
Severe	10	11.0 (10.1–11.8)	1.57 (1.40–1.69)	80 (78.5–81.8)	9/10 (90.0)	5/10 (50.0)

Values are based on the first biliary-primary ERCP for each child (n = 82). Papilla-scope apposition was graded contemporaneously during the procedure. Spearman correlations with apposition grade were ρ = -0.825 for body weight, ρ = -0.854 for age, and ρ = -0.851 for height (all P < 0.001). IQR, interquartile range.

Including all 83 biliary-primary procedures, including the single repeat biliary ERCP, produced an essentially unchanged weight–apposition association (ρ = −0.823, P < 0.001). In analyses stratified by duodenoscope family within the primary population, the inverse association was greater in magnitude for JF-260V procedures (n = 48, ρ = −0.833, P < 0.001) than for TJF-260V procedures (n = 34, ρ = −0.466, P = 0.005).

Working-space limitation and scope instability

Among the 82 procedures in the primary analysis, limited duodenal working space was recorded in 30 (36.6%). It was present in 28/33 procedures with any papilla–scope apposition and in 2/49 procedures without apposition (84.8% vs 4.1%; Fisher's exact P < 0.001). Body weight was lower in procedures with limited working space than in those without it (median 12.0 kg [IQR 11.0–14.4] vs 26.8 kg [IQR 17.9–41.8]; P < 0.001).

Scope instability was recorded in 26/82 procedures (31.7%). It occurred in 17/33 procedures with papilla–scope apposition and in 9/49 without apposition (51.5% vs 18.4%; Fisher's exact P = 0.003).

Exploratory cannulation outcomes in biliary-primary procedures

Among the 82 first biliary-primary ERCPs, deep selective cannulation was successful in 80 (97.6%). Sixty-three procedures had none/mild apposition and 19 had moderate/severe apposition. Among procedures with successful cannulation, median cannulation time was 64 s (IQR 30–180) in the none/mild group and 121.5 s (IQR 60–457.5) in the moderate/severe group (P = 0.115) (Table 3; Fig. 2).

Table 3
Cannulation outcomes according to papilla–scope apposition grade in the primary population

Papilla–scope apposition	Procedures, n	Deep selective cannulation success, n/N (%)	Cannulation time, s, median (IQR)*	Cannulation time > 300 s or failure, n/N (%)
None	49	48/49 (98.0)	64 (24.5–185)	11/49 (22.4)
Mild	14	14/14 (100.0)	77.5 (56.3–120)	2/14 (14.3)
Moderate	9	9/9 (100.0)	80 (30–600)	3/9 (33.3)
Severe	10	9/10 (90.0)	123 (60–360)	4/10 (40.0)
* Cannulation-time summaries include successful deep cannulations only (none, n = 48; mild, n = 14; moderate, n = 9; severe, n = 9).				
For none/mild versus moderate/severe apposition, median cannulation time was 64 (30–180) versus 121.5 (60-457.5) s (Mann-Whitney U test, P = 0.115). The exploratory composite outcome occurred in 13/63 (20.6%) versus 7/19 (36.8%) procedures, respectively (OR 2.24, 95% CI 0.74–6.84; Fisher's exact P = 0.221). OR, odds ratio; CI, confidence interval; IQR, interquartile range.				

The exploratory composite outcome of cannulation time > 300 s or failed deep cannulation occurred in 13/63 procedures (20.6%) with none/mild apposition and 7/19 (36.8%) with moderate/severe apposition (OR 2.24, 95% CI 0.74–6.84; P = 0.221). Of the two failed biliary cannulations, one occurred in a procedure with no apposition and one in a procedure with severe apposition.

Procedure-level sensitivity analyses including all 83 biliary-primary ERCPs gave similar results. Median cannulation time was 68 s (IQR 30–190) with none/mild apposition and 121.5 s (IQR 60–457.5) with moderate/severe apposition (P = 0.123); the corresponding composite outcome occurred in 13/64 (20.3%) and 7/19 (36.8%) procedures, respectively (OR 2.29, 95% CI 0.75–6.97; P = 0.220).

Discussion

The principal finding was the association between body size and papilla–scope apposition during biliary ERCP. In the primary analysis of the first biliary-primary ERCP for each child, median body weight

decreased from 30.0 kg in procedures without apposition to 11.0 kg in those with severe apposition, and body weight was inversely associated with apposition grade (ρ = −0.825). Age and height showed similar patterns. Inclusion of the single repeat biliary-primary procedure produced an essentially unchanged estimate.

Papilla–scope apposition was closely associated with limited duodenal working space. Limited working space was recorded in 84.8% of procedures with apposition compared with 4.1% of those without apposition, whereas the corresponding difference in scope instability was less marked (51.5% vs 18.4%). These findings suggest that working-space limitation and scope instability may reflect related but non-identical aspects of technical constraint. Restricted working space is closely linked to the spatial relationship between the scope tip and the papilla, whereas scope instability may also depend on dynamic factors during manipulation.

Previous pediatric ERCP studies have shown that standard duodenoscopes can be used successfully across a broad range of ages and body sizes [3, 5, 7–13], including a reported 5.9-kg infant treated with a JF-260V duodenoscope [13]. The present study extends this experience by describing the spatial constraints encountered around the papilla during biliary cannulation. High cannulation success and restricted papillary exposure can coexist; technical completion alone does not capture the space available for stable papillary access.

Body weight was used as the primary anthropometric measure because it is readily available and is commonly considered when selecting endoscopic equipment in children [8–11]. Similar associations with age and height suggest that body weight may serve as a practical marker of overall patient size. The inverse association between weight and apposition was observed in both duodenoscope families, but its magnitude differed between JF-260V procedures (ρ = −0.833) and TJF-260V procedures (ρ = −0.466). This difference should not be interpreted as evidence of a scope-specific effect. Scope selection was related to patient size, and the study was not designed to test an interaction between body size and duodenoscope model. Differences in case selection and instrument geometry may both have contributed to the observed subgroup estimates [15].

Cannulation outcomes showed a less consistent association with apposition. Moderate/severe apposition was accompanied by a numerically longer median cannulation time and a higher proportion of prolonged or failed cannulation, but neither comparison reached statistical significance. Only 19 procedures had moderate/severe apposition, and the corresponding estimates were imprecise. Cannulation performance is influenced by several factors beyond papillary exposure, including papillary morphology, duct anatomy, previous intervention, rescue techniques, and operator technique [16–18]. These factors were not consistently available in the retrospective records. Scope instability was recorded during the procedures, but no multivariable model was fitted for the exploratory cannulation outcomes.

Prospective studies incorporating standardized video recording could provide more objective measures of papillary exposure, including scope–papilla distance and en face alignment. Concurrent recording of

cannulation attempts, unintended pancreatic access, rescue techniques, operator, and adverse events would allow the contribution of restricted exposure to cannulation difficulty to be assessed more directly and would help determine whether these observations have practical implications for endoscope selection [19, 20].

This study has several limitations. Papilla–scope apposition was assessed visually by the operating endoscopist without measured distance thresholds or interobserver reliability testing. Limited working space and scope instability were also operator-recorded clinical assessments, and their associations with apposition may therefore partly reflect shared-observer measurement. The retrospective, single-center design limited the availability of detailed anatomical and procedural covariates. Procedures during the study period were performed by three endoscopists, but reliable procedure-level operator assignment was not available for analysis. Clinical practice and operator experience may also have evolved over the study period. The primary analysis was restricted to one biliary-primary ERCP per child; inclusion of the single repeat biliary procedure in the procedure-level sensitivity analysis did not materially change the weight–apposition association. The exploratory cannulation analyses were limited by the small number of moderate/severe apposition procedures and outcome events. Cannulation-time analyses included successful cannulations only, and the > 300-s-or-failure composite did not reproduce all components of the ESGE definition of difficult biliary cannulation [14].

Conclusions

Smaller body size was associated with greater papilla–scope apposition during pediatric biliary ERCP performed with standard duodenoscopes. Apposition was closely associated with limited duodenal working space and was accompanied by more frequent scope instability. Restricted papillary exposure could therefore be present despite a high overall cannulation success rate. Whether these procedural findings affect cannulation performance or have practical implications for endoscope selection remains to be determined in prospective studies.

Abbreviations

CI, confidence interval; ERCP, endoscopic retrograde cholangiopancreatography; ESGE, European Society of Gastrointestinal Endoscopy; IQR, interquartile range; OR, odds ratio.

Declarations

Ethics approval and consent to participate

The Wuhan Children’s Hospital Medical Ethics Committee approved the study (2024R032-E02). The committee waived individual informed consent because this retrospective study analyzed de-identified data.

Consent for publication

Not applicable.

Availability of data and materials

The data are not publicly available because they contain clinical information from pediatric patients. De-identified data may be available from the corresponding author upon reasonable request and subject to institutional review and approval.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

HL contributed to study conception and methodology, curated and analyzed the data, prepared the figures, and drafted the manuscript. RL contributed to the investigation, data curation and validation, and manuscript revision. HG and PH contributed to the investigation, data curation, and manuscript revision. YG contributed to study conception and methodology, supervised the study, and revised the manuscript. XW contributed to study conception, supervision, project administration, and manuscript revision. HL and RL contributed equally. All authors reviewed and approved the final manuscript.

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References

1. Usatin D, Fernandes M, Allen IE, Perito ER, Ostroff J, Heyman MB. Complications of endoscopic retrograde cholangiopancreatography in pediatric patients; a systematic literature review and meta-analysis. J Pediatr. 2016;179:160-165.e3. https://doi.org/10.1016/j.jpeds.2016.08.046
2. Hosseini A, Sohouli MH, Sharifi E, Sayyari A, Sridharan K, Tajalli S, et al. Indications, success, and adverse event rates of pediatric endoscopic retrograde cholangiopancreatography (ERCP): a systematic review and meta-analysis. BMC Pediatr. 2023;23:596. https://doi.org/10.1186/s12887-023-04392-5
3. Lorio E, Moreau C, Hernandez B, Rabbani T, Michaud K, Hachem J, et al. Pediatric ERCP: factors for success and complication—a 17-year, multisite experience. J Pediatr Gastroenterol Nutr. 2023;77:413-421. https://doi.org/10.1097/MPG.0000000000003875

4. Jimenez MC, Donado MJ, Zapata P, Barbosa CM, Bonitto S, Zhang D, et al. Surgeon-performed pediatric ERCP at an academic center: 10-year data. J Pediatr Endosc Surg. 2026;8:177-182. https://doi.org/10.1007/s42804-026-00317-y
5. Felux J, Sturm E, Busch A, Zerabruck E, Graepler F, Stüker D, et al. ERCP in infants, children and adolescents is feasible and safe: results from a tertiary care center. United European Gastroenterol J. 2017;5:1024-1029. https://doi.org/10.1177/2050640616687868
6. Shah R, Cohen RZ, Mekaroonkamol P, Taylor A, Freeman AJ, Fritzen C, et al. Retrospective multicenter matched controlled comparison of endoscopic retrograde cholangiopancreatography in pediatric patients: a 10-year experience. J Pediatr Gastroenterol Nutr. 2020;70:568-573. https://doi.org/10.1097/MPG.0000000000002632
7. Troendle DM, Ruan W, Fishman DS, Barth BA, Liu QY, Giefer M, et al. Technical outcomes in pediatric endoscopic retrograde cholangiopancreatography: data from an international collaborative. J Pediatr Gastroenterol Nutr. 2022;75:755-760. https://doi.org/10.1097/MPG.0000000000003612
8. ASGE Standards of Practice Committee, Lightdale JR, Acosta R, Shergill AK, Chandrasekhara V, Chathadi K, et al. Modifications in endoscopic practice for pediatric patients. Gastrointest Endosc. 2014;79:699-710. https://doi.org/10.1016/j.gie.2013.08.014
9. Tagawa M, Morita A, Imagawa K, Mizokami Y. Endoscopic retrograde cholangiopancreatography and endoscopic ultrasound in children. Dig Endosc. 2021;33:1045-1058. https://doi.org/10.1111/den.13928
10. Tringali A, Thomson M, Dumonceau JM, Tavares M, Tabbers MM, Furlano R, et al. Pediatric gastrointestinal endoscopy: European Society of Gastrointestinal Endoscopy (ESGE) and European Society for Paediatric Gastroenterology Hepatology and Nutrition (ESPGHAN) guideline executive summary. Endoscopy. 2017;49:83-91. https://doi.org/10.1055/s-0042-111002
11. Subspecialty Group of Gastroenterology, the Society of Pediatrics, Chinese Medical Association; National Clinical Research Center for Child Health Children's Digestive Disease Diagnosis and Treatment Collaborative Innovation Alliance; Editorial Board, Chinese Journal of Pediatrics. Expert consensus on clinical application management standards of endoscopic retrograde cholangiopancreatography in children (2024). Zhonghua Er Ke Za Zhi. 2024;62:396-401. https://doi.org/10.3760/cma.j.cn112140-20231128-00392
12. Yıldırım AE, Altun R, Ocal S, Kormaz M, Ozcay F, Selcuk H. The safety and efficacy of ERCP in the pediatric population with standard scopes: does size really matter? Springerplus. 2016;5:128. https://doi.org/10.1186/s40064-016-1749-9
13. Zhang T, Shu Y, Weng H, Weng M, Zhou Y, Cai W, et al. A therapeutic ERCP in an only 5.9 kg infant with obstruction jaundice using JF-260V duodenoscope. BMC Pediatr. 2024;24:281. https://doi.org/10.1186/s12887-024-04765-4
14. Testoni PA, Mariani A, Aabakken L, Arvanitakis M, Bories E, Costamagna G, et al. Papillary cannulation and sphincterotomy techniques at ERCP: European Society of Gastrointestinal

Endoscopy (ESGE) Clinical Guideline. Endoscopy. 2016;48:657-683. https://doi.org/10.1055/s-0042-108641

15. Barakat MT, Liman A, Gugig R. Initial experience with duodenoscopes with single-use end caps in pediatric ERCP: infection prevention comes at a cost. Gastrointest Endosc. 2024;100:312-316. https://doi.org/10.1016/j.gie.2024.03.009
16. Troendle DM, Abraham O, Huang R, Barth BA. Factors associated with post-ERCP pancreatitis and the effect of pancreatic duct stenting in a pediatric population. Gastrointest Endosc. 2015;81:1408-1416. https://doi.org/10.1016/j.gie.2014.11.022
17. Wang X, Li R, Li W, Huang P, Yang H, Guo H, et al. Post-ERCP adverse events in children: a systematic review and meta-analysis of post-ERCP pancreatitis incidence with synthesis of risk factors and prevention strategies. BMC Gastroenterol. 2026. https://doi.org/10.1186/s12876-026-05124-6
18. Gupta R, Khalaf RT, Morrison J, Amankwah E, Ruan W, Fishman DS, et al. Impact of trainee involvement on pediatric ERCP procedures: results from the Pediatric ERCP Initiative. J Pediatr Gastroenterol Nutr. 2023;77:126-130. https://doi.org/10.1097/MPG.0000000000003782
19. Lightdale JR, Walsh CM, Oliva S, Jacobson K, Huynh HQ, Homan M, et al. Pediatric Endoscopy Quality Improvement Network quality standards and indicators for pediatric endoscopic procedures: a joint NASPGHAN/ESPGHAN guideline. J Pediatr Gastroenterol Nutr. 2022;74(S1 Suppl 1):S30-S43. https://doi.org/10.1097/MPG.0000000000003264
20. Walsh CM, Lightdale JR, Fishman DS, Furlano RI, Mamula P, Gillett PM, et al. Pediatric Endoscopy Quality Improvement Network pediatric endoscopy reporting elements: a joint NASPGHAN/ESPGHAN guideline. J Pediatr Gastroenterol Nutr. 2022;74(S1 Suppl 1):S53-S62. https://doi.org/10.1097/MPG.0000000000003266

Figures

Fig. 1

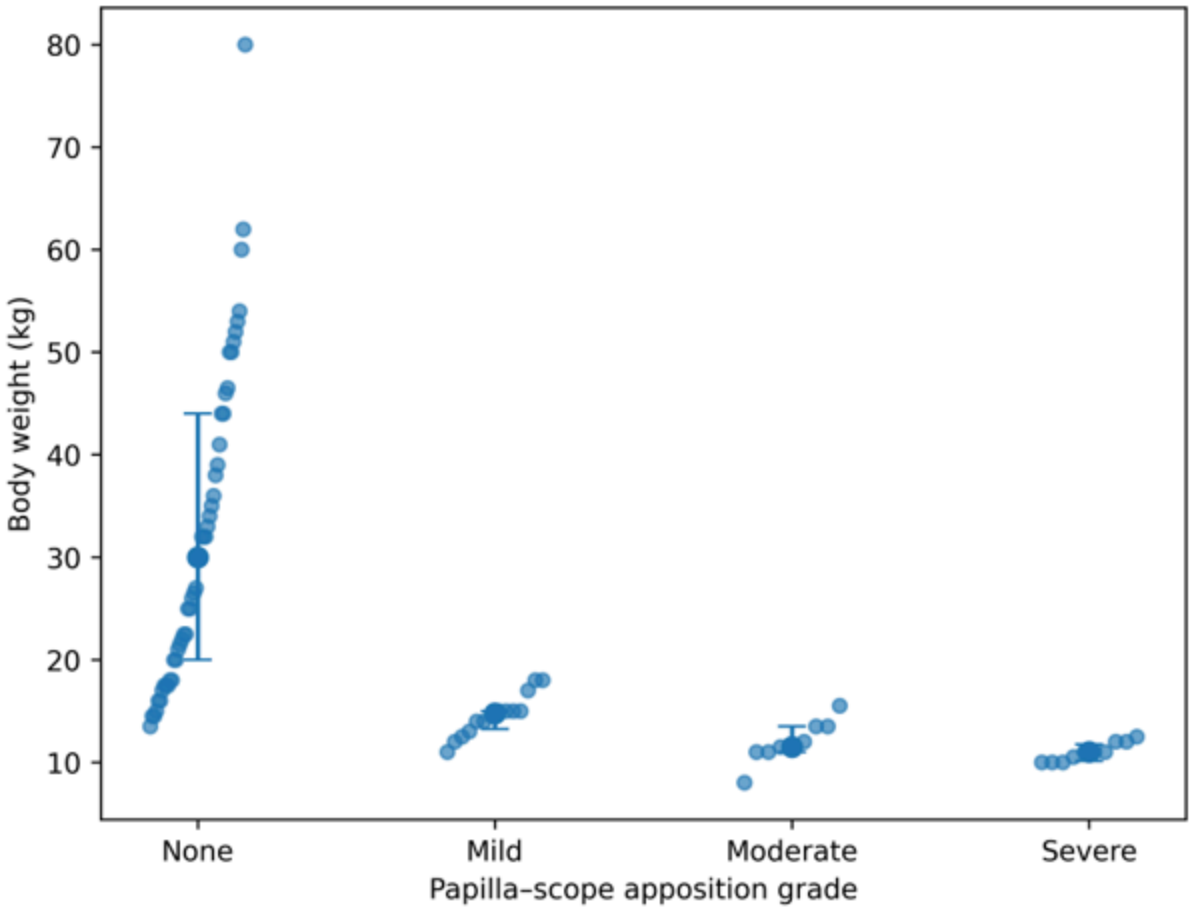


Figure 1

Body weight across papilla–scope apposition grades in the primary population. Individual body weights are shown for the first biliary-primary ERCP in each child (n = 82). Large points and error bars indicate medians and interquartile ranges. Body weight was inversely associated with papilla–scope apposition grade (Spearman ρ = −0.825, P < 0.001).

Fig. 2

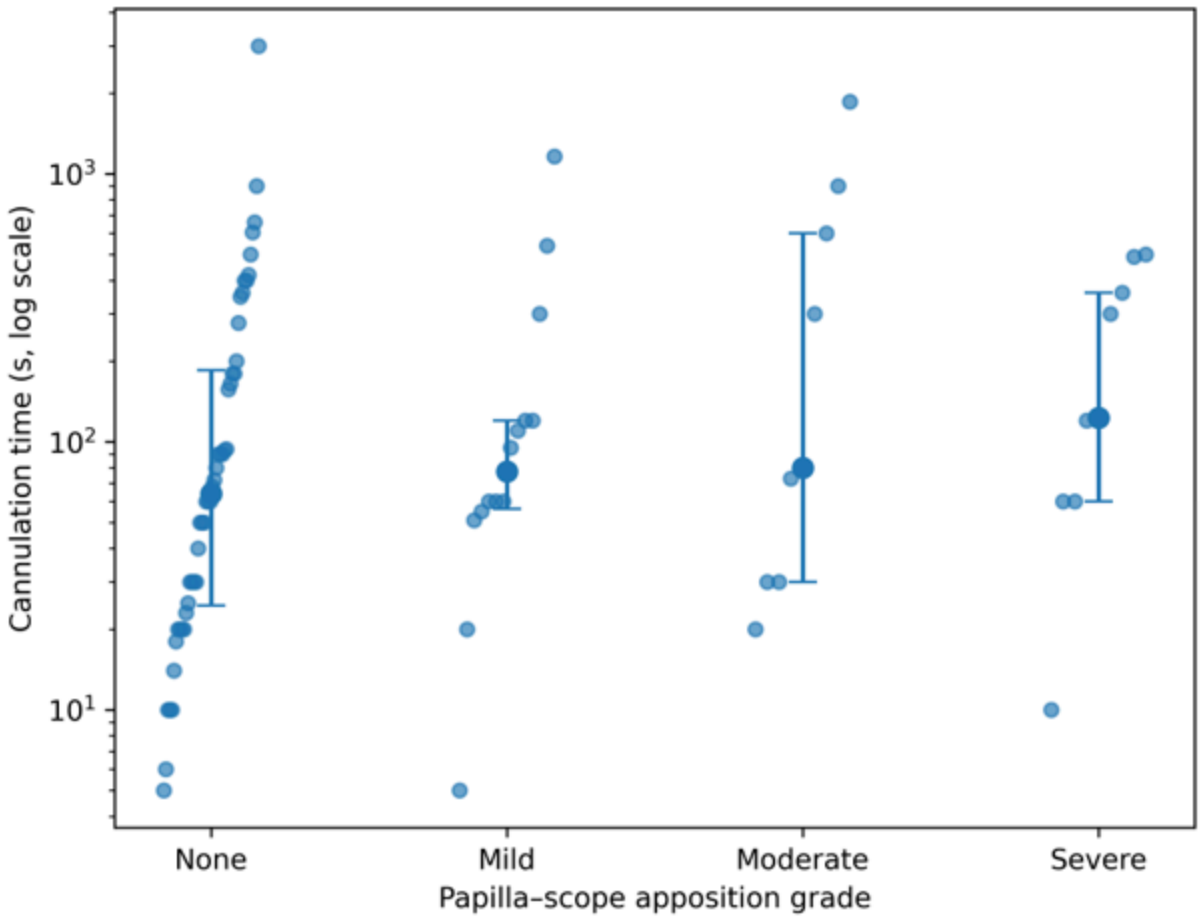


Figure 2

Cannulation time across papilla–scope apposition grades in the primary population. Cannulation time is shown for the 80 successful deep selective cannulations among the first biliary-primary ERCP for each child. Large points and error bars indicate medians and interquartile ranges. The vertical axis is logarithmic. The two failed cannulations are not included because no successful completion time was available.