Supplementary

Table S1 Details of article research

	Number of articles
PubMed	1485
Wiley Online Library	0
Cochrane library	0
Google Scholar	257
Web of Science	815
CNKI	0
VIP	53
Wanfang	1449

Table S2 The information of included studies

Study	Hospital	Baseline information	Producers of ^{125}I	half-life (days)	Mean ^{125}I seeds
Asihaer Hasimu (2017)	The First Affiliated Hospital o fXinJiang Medical University	Balanced	Beijing Atom Hi-Tech Co., Ltd. (Beijing, China)	59.43	energy of 27.4keV for x-rays,31.4keV for χ-rays, and 35.5keV for γ-rays, with a 20-mm effectiverange;15.46 ± 2.30 (range,9–18)
Hai-Dong Zhu (2012)	Zhong-Da Hospital, Medical School, Southeast University	Balanced	Nanjing MicroInvasive Medical Inc. (Nanjing, China)	59.6	energy of 27.4 keV for X rays and 35.5 keV for R rays;7.13 mCi (263.93 MBq), ranging from 6 to 8 mCi (222–296 MBq)
Hui-Wen Wang (2021)	Harbin Medical University Cancer Hospital	Balanced	Nanjing Minitron Co. Ltd. (Nanjing, China)	59.43	energy of 27.4 keV for X rays and 35.5 keV for R rays;33.3MBq
Chuanguo Zhou (2019)	Affiliated Hospital of Capital Medical University	Balanced	Zhibo Gaoke Biotechnology (Beijing, China).	60.1	energy of 27.4-31.4 keV for X rays and 35.5 keV for R rays; 11.1–37 MBq (0.3mCi-1.0mCi); 20mm;15.2 ± 4.1 [range, 8–25] seeds per patient
Hao Jiang (2015)	Affiliated Hospital of Nantong University	Balanced	Shanghai Kexin Co. Ltd. (Shanghai, China).	59.6	The reflection activity of a single particle, 0.60–0.80 mCi
Chuanguo Zhou (2018)	Beijing Chaoyang Hospital, Capital Medical University	Balanced	Zhibo Gaoke Biotechnology (Beijing, China).	60.1	The reflection activity of a single particle, 0.5–0.6 mCi; 16.0±4.5(10~24); energy of 27.4-31.4 keV for X rays and 35.5 keV for R rays; 11.1–37 MBq (0.3mCi-1.0mCi); 20mm
Chenglong Han (2015)	Affiliated Tumor Hospital of Guangxi Medical University	Balanced	Shanghai Kexin Co. Ltd. (Shanghai, China).	59.6	11 (8–15)
Xuejun Wang (2019)	Yancheng Third People's Hospital	Balanced	Ningbo Junan Technology Co., Ltd. (Ningbo, China)	59.6	energy of 27.4-31.4 keV for X rays and 35.5 keV for R rays ;10.4MBq~37 MBq (0.28~1.0) mCi
Chao Zhu (2020)	The First Affiliated Hospital of Bengbu Medical College	Balanced	Beijing Atom Hi-Tech Co.,Ltd. (Beijing, China)	59.43	energy of 27.4-31.4 keV for X rays and 35.5 keV for R rays ;11.1–37 MBq (0.3mCi-1.0mCi)
Shengxian Fei (2015)	The First Affiliated Hospital of Bengbu Medical College	Balanced	NA	59.6	energy of 27.4-31.4 keV for X rays and 35.5 keV for R rays ;11.1–37 MBq (0.3mCi-1.0mCi)
Xiaoxi Fan (2017)	The First Affiliated Hospital of Wenzhou Medical University	Balanced	Tianjin Saide Biotechnology Co., Ltd. (Tianjin, China)	60.1	The reflection activity of a single particle, 0.7–0.9 mCi; energy of 27.4-31.4 keV for X rays and 35.5 keV for R rays
Hongdou Xu (2020)	The First Affiliated Hospital of Nanjing Medical University	Balanced	Beijing Atom Hi-Tech Co.,Ltd. (Beijing, China)	59.43	energy of 27.4 keV for X rays and 35.5 keV forR rays; The reflection activity of a single particle, 0.8mCi

Balanced, the baseline data of the 2 groups are balanced and comparable.

https://dx.doi.org/10.21037/qims-22-824

Table S3 Article quality assessment by NOS scale

Study	Representativeness of the exposed cohort (1)	Selection of the non-exposed cohort (1)	Ascertainment of exposure (1)	Demonstration that outcome of interest was not present at start of study (1)	Compare ability of cohorts on the basis of the design or analysis (2)	Assessment of outcome (1)	Was follow up long enough for outcomes to occur (1)	Adequacy of follow up of cohorts (1)	Total
Asihaer Hasimu (2017)	1	1	1	1	2	1	1	1	9
Hai-Dong Zhu (2012)	1	1	1	1	2	1	1	1	9
Hui-Wen Wang (2021)	1	1	1	1	2	1	1	1	9
Chuanguo Zhou (2019)	1	1	1	1	1	1	1	1	8
Hao Jiang (2015)	1	1	1	0	1	1	1	1	7
Chuanguo Zhou (2018)	1	1	1	1	1	1	1	1	8
Chenglong Han (2015)	1	1	1	1	1	1	1	1	8
Xuejun Wang (2019)	1	1	1	1	1	1	1	1	8
Chao Zhu (2020)	1	1	1	1	1	1	1	1	8
Shengxian Fei (2015)	1	1	1	0	1	1	1	1	7
Xiaoxi Fan (2017)	1	1	1	1	1	1	1	1	8
Hongdou Xu (2020)	1	1	1	1	1	1	1	0	7

NOS, Newcastle-Ottawa Scale.

Table S4 Article quality assessment by Cochrane risk of bias tool

Risk evaluation standard	
Domain1	Risk of bias arising from the randomization process
Domain2	Risk of bias due to deviations from the intended interventions
Domain3	Risk of bias due to missing outcome data
Domain4	Risk of bias in measurement of the outcome
Domain5	Risk of bias in selection of the reported result
Risk classification	
Low risk of bias	The study is judged to be at low risk of bias for all domains for this result.
Some concerns	The study is judged to raise some concerns in at least one domain for this result, but not to be at high risk of bias for any domain.
High risk of bias	The study is judged to be at high risk of bias in at least one domain for this result. Or the study is judged to have some concerns for multiple domains in a way that substantially lowers confidence in the result.

	Overall risk of bias				
Study	Domain 1	Domain 2	Domain 3	Domain 4	Domain 5
Asihaer Hasimu (2017)	Low	Low	Low	Low	Some concerns
Hai-Dong Zhu (2012)	Low	Low	Low	Low	Some concerns
Hui-Wen Wang (2021)	Some concerns	Low	Some concerns	Low	Some concerns

https://dx.doi.org/10.21037/qims-22-824

Table S5 Population composition of included studies

Study	Population[a]	Definition in the text	Cholangio-carcinoma	Gallbladder cancer	Liver cancer	Pancreatic cancer	Duodenal cancer	Metastatic cancer	Gastrointestinal cancer	Other cancer
20Asihaer Hasimu (2017)	1	Malignant biliary obstruction	49	6	--	--	--	--	--	--
21Hai-Dong Zhu (2012)	2	Malignant biliary obstruction	--	--	--	13	--	10	--	--
22 Hui-Wen Wang (2021)	2	Malignant biliary obstruction	--	19	--	35	--	13	--	--
23 Chuanguo Zhou (2019)	2	Malignant biliary obstruction	41	5	--	18	3	9	--	--
24Hao Jiang (2015)	0	Malignant biliary obstruction caused by Cholangiocarcinoma	54	--	--	--	--	--	--	--
25 Chuanguo Zhou (2018)	1	Malignant hilar biliary obstruction	11	3	--	14	4	6	--	--
26 Chenglong Han (2015)	1	Malignant biliary obstruction	15	--	11	--	--	14	--	--
27 Xuejun Wang (2019)	2	Malignant biliary obstruction	24	9	19	13	--	--	--	--
28 Chao Zhu (2020)	1	Malignant hilar biliary obstruction	34	5	--	--	--	--	--	3
29 Shengxian Fei (2015)	0	Malignant obstructive jaundice caused by cholangiocarcinoma	52	--	--	--	--	--	--	--
30 Xiaoxi Fan (2017)	1	Malignant hilar biliary obstruction	7	1	1	--	--	2	--	--
31 Hongdou Xu (2020)	2	Malignant biliary obstruction	52	16	17	22	1	--	19	15

[a] "0" represents malignant biliary obstruction patients caused by Cholangiocarcinoma, “1” represents malignant biliary obstruction patients caused by hilar malignant tumor; “2” represents malignant biliary obstruction patients caused by mixed tumors.

https://dx.doi.org/10.21037/qims-22-824

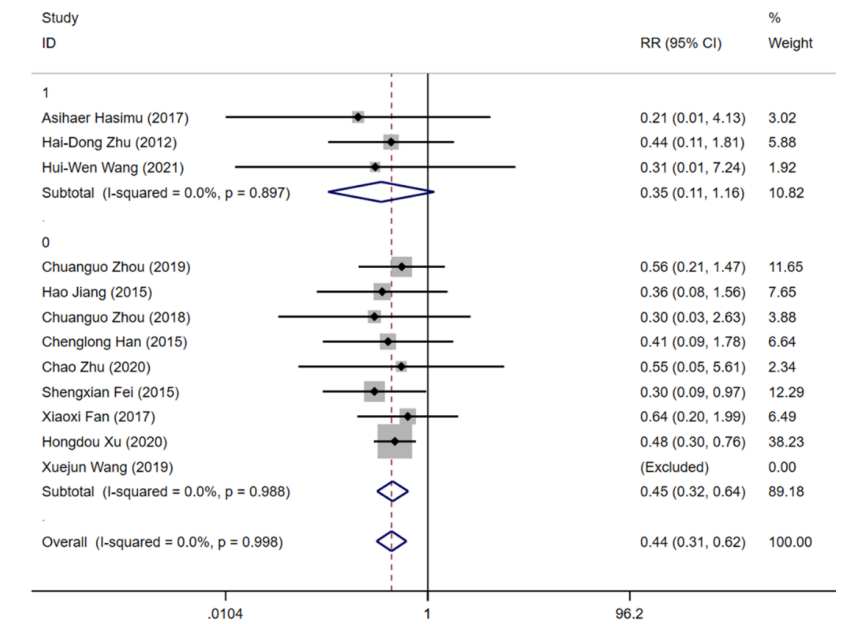

Figure S1 Subgroup analysis of death risk by study design. RCT, randomized controlled trial; RR, risk ratio; CI, confidence interval.

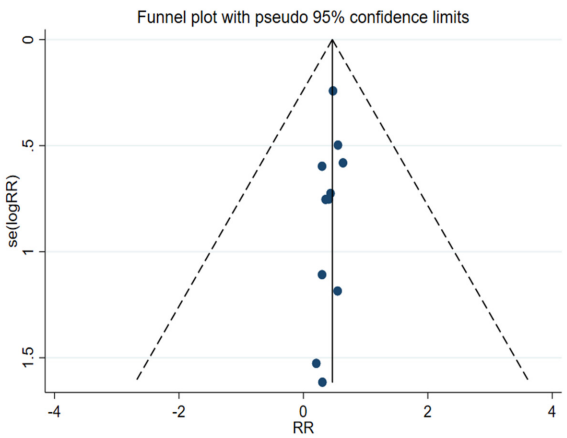

Figure S2 Funnel plot of death risk. RR, relative risk.

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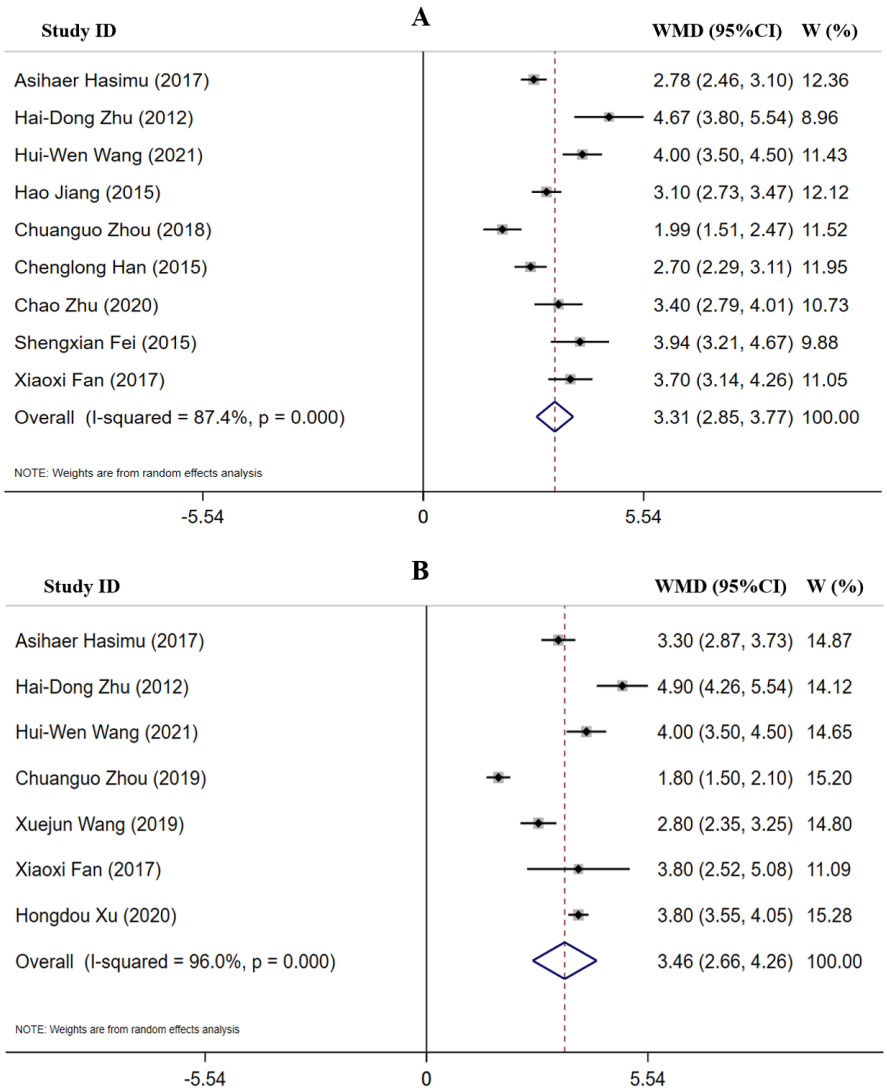

Figure S3 Comparison of survival between 125I groups and control groups. (A) Comparison of mean survival; (B) Comparison of median survival. WMD, weighted mean difference; CI, confidence interval; W, weight.

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Table S6 The pooled results of MBO patients' survival

Study	Control group		I^{125} group		WMD (95%CI)	Sensitivity analysis	Control group		I^{125} group		WMD (95%CI)	Sensitivity analysis
	Mean	SD	Mean	SD			M	SD	M	SD		
Asihaer Hasimu (2017)	4.64	0.49	7.42	0.72	2.780 (2.456, 3.104)	3.392 (2.854, 3.931)	4.73	0.82	8.03	0.79	3.300 (2.874, 3.726)	3.491 (2.538, 4.444)
Hai-Dong Zhu (2012)	3.36	1.13	8.03	0.99	4.670 (3.798, 5.542)	3.172 (2.728, 3.616)	2.50	0.90	7.40	0.63	4.900 (4.260, 5.540)	3.218 (2.405, 4.032)
Hui-Wen Wang (2021)	7.00	0.30	11.00	1.40	4.000 (3.505, 4.495)	3.214 (2.751, 3.676)	7.00	0.30	11.00	1.40	4.000 (3.505, 4.495)	3.368 (2.471, 4.264)
Chuanguo Zhou (2019)	--	--	--	--	--	--	4.10	0.70	5.90	0.61	1.800 (1.503, 2.097)	3.736 (3.222, 4.25)
Hao Jiang (2015)	8.60	0.60	11.70	0.80	3.100 (2.726, 3.474)	3.349 (2.803, 3.895)	--	--	--	--	--	--
Chuanguo Zhou (2018)	4.74	0.51	6.73	0.92	1.990 (1.510, 2.470)	3.465 (3.042, 3.888)	--	--	--	--	--	--
Chenglong Han (2015)	8.70	0.50	11.40	0.80	2.700 (2.294, 3.106)	3.398 (2.878, 3.918)	--	--	--	--	--	--
Xuejun Wang (2019)	--	--	--	--	--	--	5.53	0.49	8.33	1.25	2.800 (2.350, 3.250)	3.576 (2.642, 4.511)
Chao Zhu (2020)	7.80	1.00	11.20	1.00	3.400 (2.794, 4.006)	3.303 (2.796, 3.810)	--	--	--	--	--	--
Shengxian Fei (2015)	8.89	1.08	12.83	1.57	3.940 (3.208, 4.672)	3.240 (2.758, 3.722)	--	--	--	--	--	--
Xiaoxi Fan (2017)	12.70	0.50	16.40	0.90	3.700 (3.144, 4.256)	3.263 (2.767, 3.759)	7.40	1.96	11.20	10.60	3.800 (-1.872, 9.472)	3.416 (2.558, 4.275)
Hongdou Xu (2020)	--	--	--	--	--	--	6.90	0.37	10.70	0.87	3.800 (3.547, 4.053)	3.403 (2.45, 4.355)
Pooled-SMD	--	--	--	--	3.310 (2.848, 3.771)	3.310 (2.848, 3.771)	--	--	--	--	3.458 (2.658, 4.259)	3.458 (2.658, 4.259)

WMD, weighted mean difference; CI, confidence interval; SD, standard deviation; M, median.

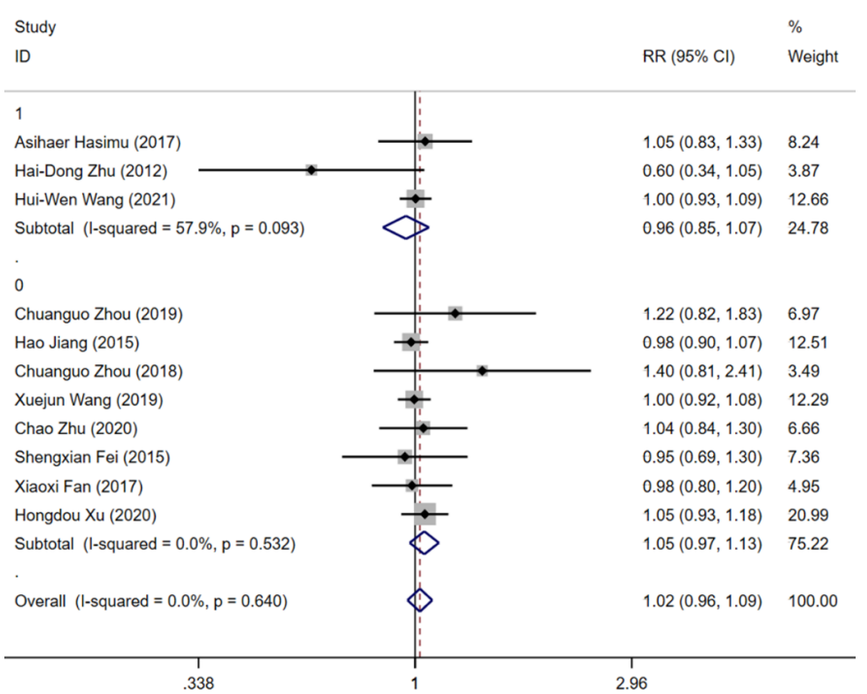

Figure S4 Subgroup analysis of complication risk by study design. RCT, randomized controlled trial; RR, risk ratio; CI, confidence interval.

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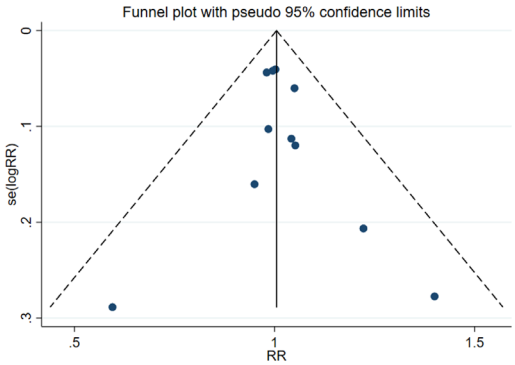

Figure S5 Funnel plot of complication risk. RR, relative risk.

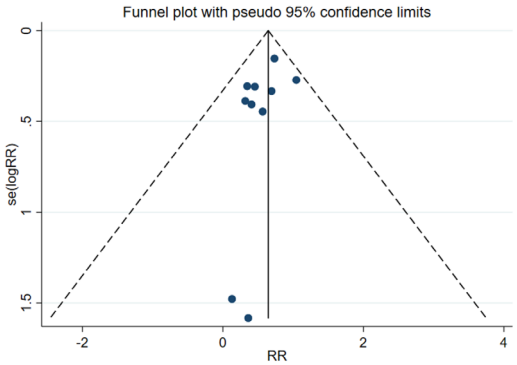

Figure S7 Funnel plot of stent occlusion risk. RR, risk ratio.

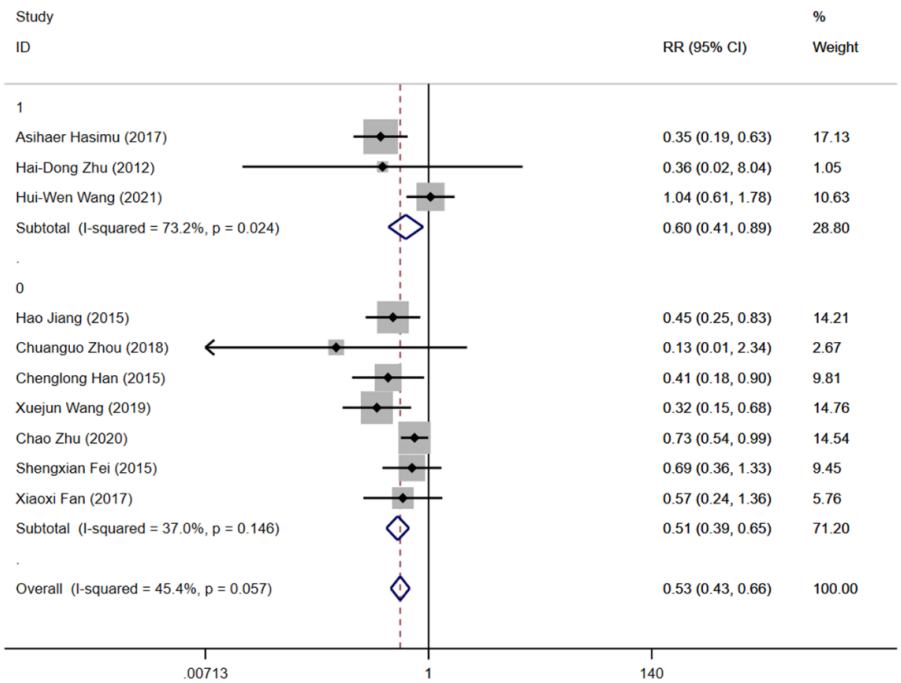

Figure S6 Subgroup analysis of stent occlusion risk by study design. RCT, randomized controlled trial; RR, risk ratio; CI, confidence interval.

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Table S7 The pooled results of MBO patients' stent patency time

Study	Control group		I^{125} group		WMD (95%CI)	Sensitivity analysis	Control group		I^{125} group		WMD (95%CI)
	Mean	SD	Mean	SD			Median	SD	Median	SD	
Asihaer Hasimu (2017)	2.94	0.45	6.36	0.66	3.420 (3.122, 3.718)	3.395 (2.440, 4.350)	2.57	0.18	5.97	1.53	3.400 (2.829, 3.971)
Hui-Wen Wang (2021)	5.80	0.20	9.50	0.60	3.700 (3.482, 3.918)	3.337 (2.383, 4.291)	6.00	0.30	9.00	1.40	3.000 (2.505, 3.495)
Hao Jiang (2015)	6.20	0.40	8.70	0.70	2.500 (2.203, 2.797)	3.578 (2.721, 4.436)	--	--	--	--	--
Chuanguo Zhou (2018)	4.05	0.51	6.43	0.95	2.380 (1.887, 2.873)	3.591 (2.756, 4.426)	--	--	--	--	--
Chenglong Han (2015)	6.20	0.40	8.70	0.70	2.500 (2.154, 2.846)	3.576 (2.719, 4.434)	--	--	--	--	--
Xiaoxi Fan (2017)	6.70	0.80	12.70	0.70	6.000 (5.402, 6.598)	2.915 (2.340, 3.490)	--	--	--	--	--
Pooled RR					3.394 (2.639, 4.148)	3.394 (2.639, 4.148)					3.174 (2.785, 3.562)

WMD, weighted mean difference; CI, confidence interval; SD, standard deviation; M, median.

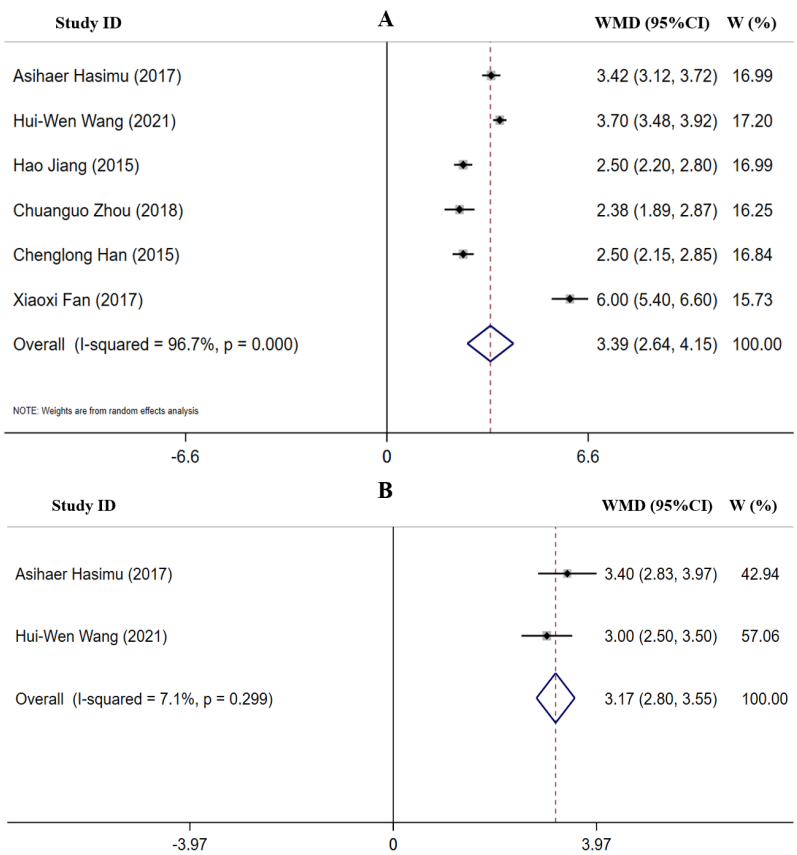

Figure S8 Comparison of stent patency time between 125I groups and control groups. (A) Comparison of mean stent patency time; (B) Comparison of median stent patency time. WMD, weighted mean difference; CI, confidence interval; W, weight.

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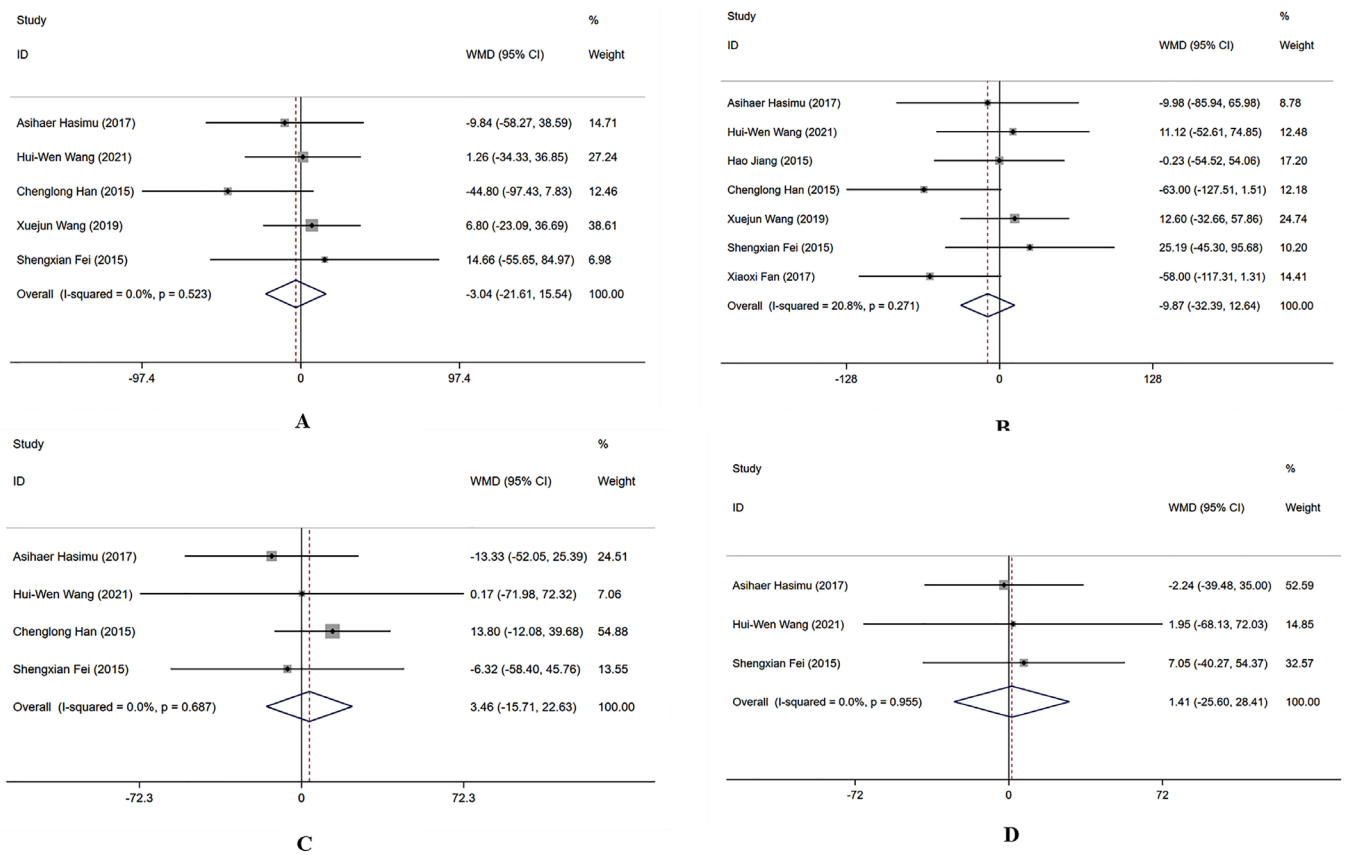

Figure S9 Baseline liver function index levels of 125I groups and control groups. (A) Serum TBIL levels; (B) Serum DBIL levels; (C) Serum ALT levels; (D) Serum AST levels. TBIL, total bilirubin; ALT, alanine transaminase; AST, aspartate transaminase; WMD, weighted mean difference; CI, confidence interval.

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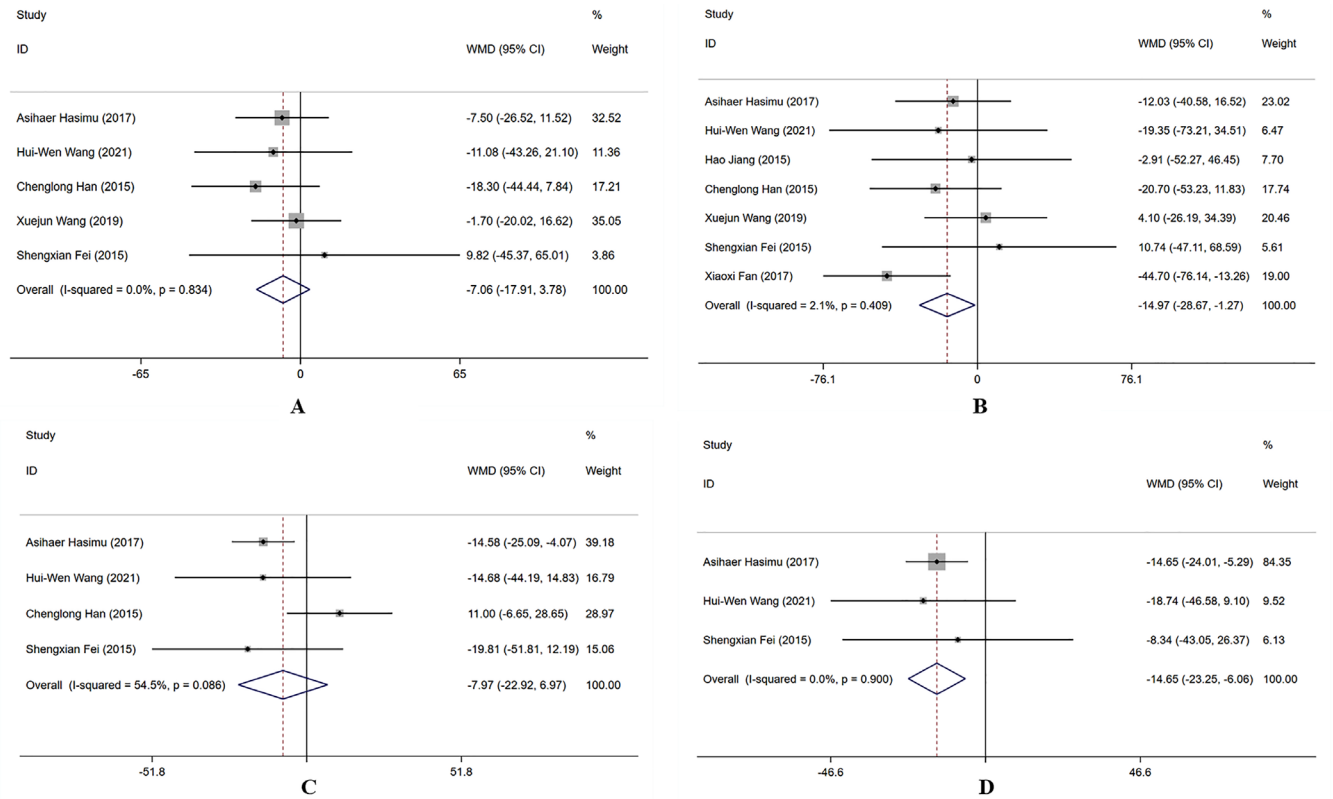

Figure S10 Liver function index levels of 125I group and control group one week after surgery. (A) Serum TBIL levels; (B) Serum DBIL levels; (C) Serum ALT levels; (D) Serum AST levels. TBIL, total bilirubin; DBIL, direct bilirubin; ALT, alanine transaminase; AST, aspartate transaminase; WMD, weighted mean difference; CI, confidence interval.

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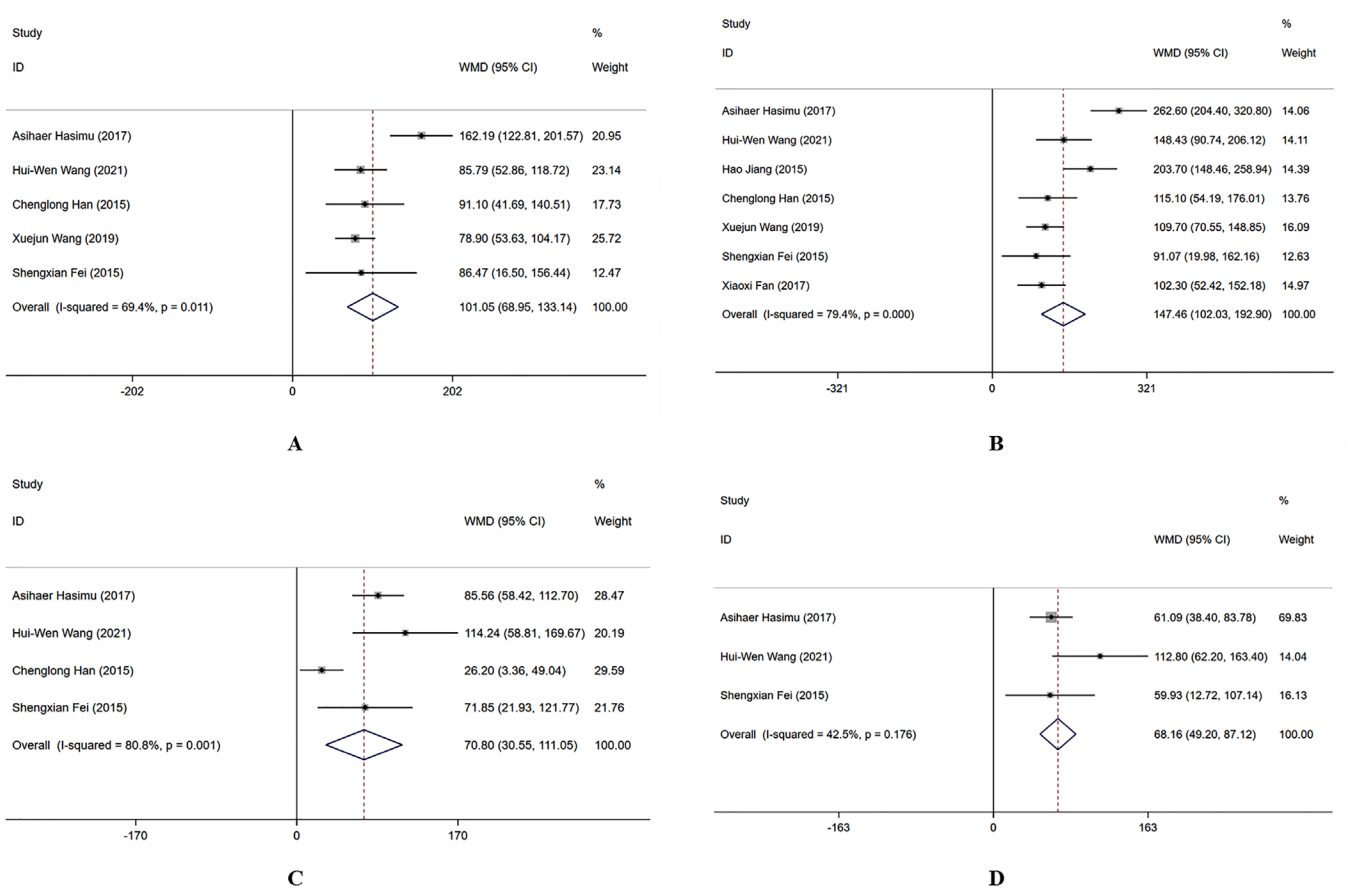

Figure S11 The changes of liver function index in control group before and after treatment. (A) Serum TBIL levels; (B) Serum DBIL levels; (C) Serum ALT levels; (D) Serum AST levels. TBIL, total bilirubin; DBIL, direct bilirubin; WMD, weighted mean difference; CI, confidence interval.

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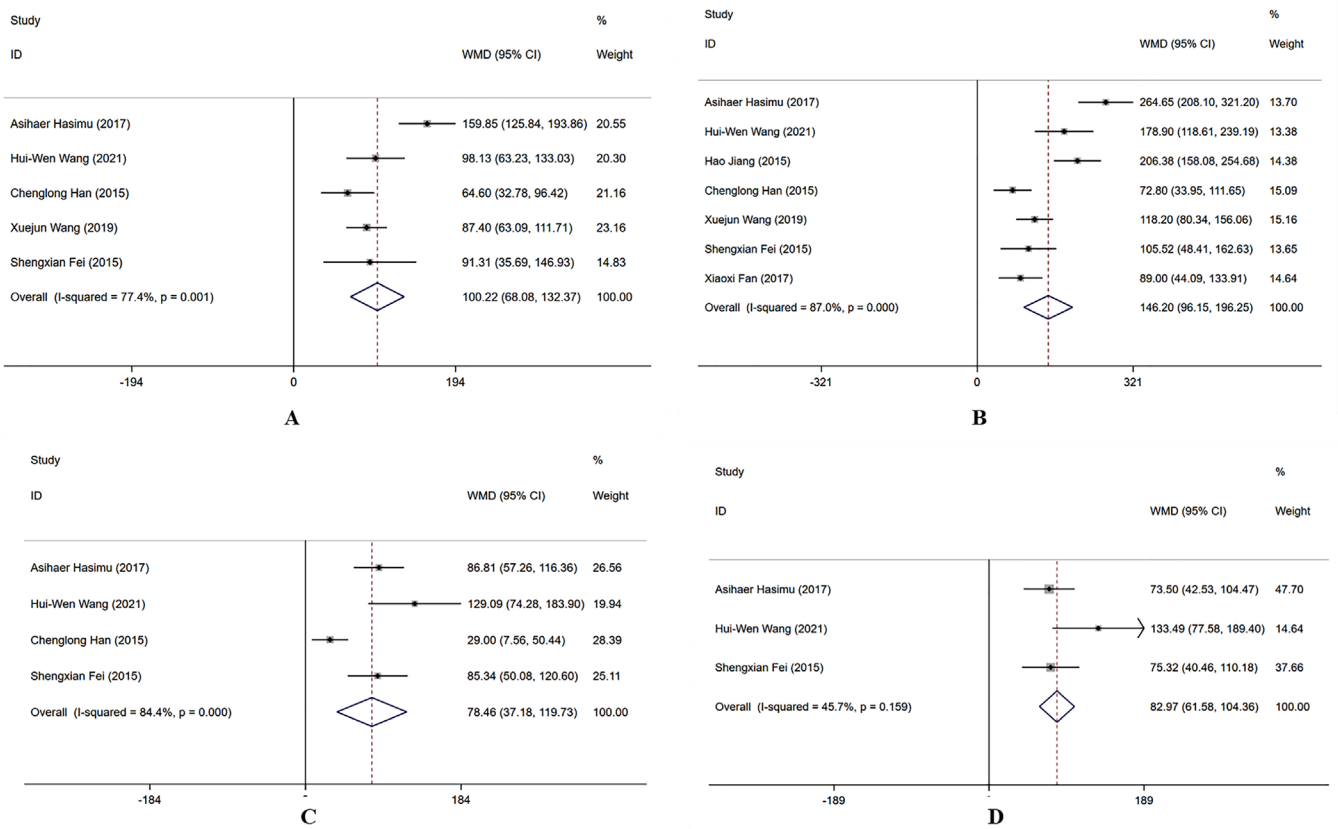

Figure S12 The changes of liver function index in 125I group before and after treatment. (A) Serum TBIL levels; (B) Serum DBIL levels; (C) Serum ALT levels; (D) Serum AST levels. TBIL, total bilirubin; DBIL, direct bilirubin; WMD, weighted mean difference; CI, confidence interval.

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Table S8 Heterogeneity test and Meta-regression of Biochemical Indicators

Biochemical Indicators		Heterogeneity test			Egger test	
		Heterogeneity χ^2	P-value	I^2	β	P-value
DBIL	Baseline	3.21	0.523	0.0%	-1.130	0.504
	1W	1.46	0.834	0.0%	0.076	0.941
	CG	13.09	0.011	69.4%	1.456	0.643
	IG	17.72	0.001	77.4%	1.355	0.780
TBIL	Baseline	7.57	0.271	20.8%	-1.406	0.632
	1W	6.13	0.409	2.1%	0.934	0.581
	CG	29.08	<0.001	79.4%	2.966	0.571
	IG	46.27	<0.001	87.0%	9.124	0.140
ALT	Baseline	1.48	0.687	0.0%	-1.040	0.393
	1W	6.59	0.086	54.5%	0.331	0.890
	CG	19.25	<0.001	84.4%	6.506	0.089
	IG	15.66	0.001	80.8%	3.710	0.351
AST	Baseline	0.09	0.955	0.0%	0.328	0.702
	1W	0.21	0.900	0.0%	0.084	0.893
	CG	3.48	0.176	42.5%	1.933	0.544
	IG	3.68	0.159	45.7%	4.812	0.111

Baseline, before surgery; 1W, 1 week after surgery; CG, control group; IG, ^{125}I group; TBIL, total bilirubin; DBIL, direct bilirubin; AST, aspartate transaminase; ALT, alanine transaminase.

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