

Figure S1 The distributions of propensity scores before and after matching.

Table S1 Recurrence patterns, timing, and treatments between LH and OH before and after PSM

	Before PSM			After PSM		
	LH (n=1,158)	OH (n=752)	P value	LH (n=576)	OH (n=529)	P value
Patterns, n (%)						
Resectable PM	39 (3.4%)	27 (3.6%)	0.108	26 (4.5%)	27 (5.1%)	0.312
IHR only	818 (70.6%)	520 (69.1%)	0.013	400 (69.4%)	365 (69.0%)	0.256
IHR and extra-abdominal metastasis	174 (15.0%)	109 (14.5%)	0.327	86 (15.0%)	79 (14.9%)	0.712
EPM only	104 (9.0%)	81 (10.8%)	0.097	54 (9.4%)	43 (8.2%)	0.352
Unresectable PM	23 (2.0%)	15 (2.0%)	0.573	10 (1.7%)	15 (2.8%)	0.335
DFS (mon) ^a	11 (6–17)	11 (5–16)	0.421	11 (6–16)	11 (6–16)	0.925
Treatment, n (%)						
Surgery	199 (17.2%)	136 (18.1%)		99 (17.2%)	93 (17.5%)	
RFA	152 (13.1%)	144 (19.1%)		92 (16.0)	86 (16.3%)	
TACE	426 (36.8%)	302 (40.2%)		213 (37.0%)	196 (37.1%)	
Radiotherapy	36 (3.1%)	15 (2.0%)		11 (1.9%)	10 (1.9%)	
Conservative treatment	345 (29.8%)	155 (20.6%)		161 (27.9%)	144 (27.2%)	

^a median (IQR). LH, laparoscopic hepatectomy, OH, open hepatectomy; PSM, propensity score matching; DFS, disease-free survival; RFA, radiofrequency ablation; TACE, transarterial chemoembolization.

Table S2 Characteristics and outcomes of patients in different periods of LH

Variables	Whole Cohort (n=2,138)		P value
	2010–2013, (n=295) (13.8%)	2014–2016, (n=1,843) (86.2%)	
PM incidence	15/295 (5.1%)	47/1,843 (2.6%)	0.016
Patients			
Age (<53/≥53 years)	141/154	907/936	0.651
Female/Male	40/255	273/1,570	0.572
BMI (<25/≥25) kg/m ²	251/44	1,524/319	0.065
Liver function			
Child-Pugh (A/B)	274/21	1,755/88	0.368
HBV positive (yes/no)	263/32	1,645/198	0.516
HCV positive (yes/no)	10/285	31/1,812	0.638
Tumor factors			
Number (solitary/multiple)	267/28	1,632/211	0.322
Tumor diameter (≤5 vs. >5 cm)	262/33	1,445/398	0.035
Location of the tumor (anterolateral/posterosuperior segment)	176/119	977/866	0.041
Lesions <2 cm from major blood vessel (yes/no) ^a	60/235	583/1,260	0.002
Surgical factors			
Hepatectomy (minor/major)	238/57	1,603/240	0.074
Surgical difficulty (low/intermediate/high) ^b	176/64/55	691/534/618	0.013
Anatomical resection of the liver (yes/no)	56/239	586/1,257	0.048
Peritoneal metastasis (yes/no)	15/280	47/1,796	0.016
Multiple recurrent peritoneal lesions (yes/no)	11/4	38/9	0.655

^a Major hepatic vein and inferior vena cava; ^b Difficulty scoring system for laparoscopic liver resection proposed by Japanese Society of Hepato–Biliary–Pancreatic Surgery. LH, laparoscopic hepatectomy; BMI, body mass index; HBV, hepatitis B virus; HCV, hepatitis C virus.

Table S3 Clinicopathological characteristics of the peritoneal metastasis patients after LH

Factors at initial hepatectomy	PM patients (n=62)
Age (years) ^a	52 (28–74)
Gender (male/female)	51/11
Virus hepatitis (positive/negative)	52/10
BMI (<18.5/18.5–24.9/≥25 kg/m ²)	13/29/20
Platelet count (×10 ³ /μL) ^a	151.6 (102.5–191.2)
Albumin (g/L) ^a	36.4 (32.6–41.2)
AFP (≥400/<400 ng/mL)	23/39
NLR ^a	2.5 (1.2–4.1)
Child–Pugh class (A/B)	33/29
Liver cirrhosis (yes/no)	46/16
Type of hepatectomy (anatomical/non-anatomical)	8/54
Width of surgical margin (≥5 mm/<5 mm)	62/0
Tumor number (solitary/multiple)	14/48
Main tumor diameter (cm) ^a	6 (4–7)
Lesions <2 cm from the major blood vessel (yes/no)	37/25
Cancer cell differentiation	
Well/Moderate	30 (48.4%)
Poor	32 (51.6%)
Microscopic vascular invasion (yes/no)	45/17
Factors at first recurrence of PM	
Time to recurrence (≥1 year/<1 year)	20/42
Child–Pugh class (A/B)	30/32
Tumor number (solitary/multiple)	20/42
NLR ^a	2.8 (1.7–4.1)
AFP (≥400/<400 ng/mL)	20/42
Main tumor diameter (cm) ^a	2.2 (1.6–4.1)
Treatment modalities for recurrence	
Curative resection	24 (38.7%)
Palliative resection	15 (24.2%)
Nonoperating management (Unresectable)	23 (37.1%)
PCI (≤8/>8) ^b	37/25

Table S3 (continued)

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Factors at initial hepatectomy	PM patients (n=62)
CC score (0/1)	41/21
At last follow-up	
Alive	26 (41.9%)
Died from HCC	36 (58.1%)
Median OS (mon)	39

^a median (IQR); ^b The optimal cut off level of the PCI were 8, using the software X-tile. PM, peritoneal metastasis; BMI, body mass index; AFP, α-fetoprotein; NLR, Neutrophil to lymphocyte ratio; PCI, Peritoneal Cancer Index; CC score, Completeness of Cytoreduction score; OS, overall survival.

Table S4 Peri-operative complications for PM patients according to National Cancer Institute CTCAE v5.0.

Grade 2/3 adverse events	4
Type of serious complications ^a	
Infectious complications	1
Respiratory/Thoracic/Mediastinal complications	1
Gastrointestinal	2
Hepatobiliary	1
Post-operative death	0

^a Details of complications, few patients could undergo more than one complication.

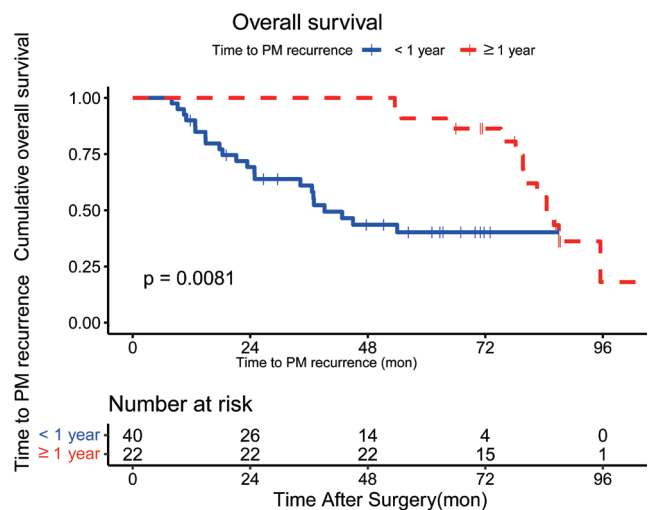


Figure S2 Peritoneal metastasis occurred within one year had a significant worse prognosis than late recurrence patients (≥1 year).

Table S5 Univariate and multivariate Cox regression analyses for prognostic factors in patients with PM

Variables	Univariate analysis HR (95% CI)	P value	Multivariate analysis HR (95% CI)	P value
BMI (<18.5 vs. \geq 18.5 Kg/m ²)	3.785 (1.153–8.423)	0.058		
AFP at detection of PM (\geq 400 vs. <400 ng/mL)	0.736 (0.363–1.490)	0.393		
Child grade (B vs. A)	2.443 (1.188–5.025)	0.045	1.013 (0.157–2.036)	0.071
Time to recurrence (\geq 1 year vs. <1 year)	0.213 (0.012–0.9231)	0.011	0.59 (0.232–1.231)	0.062
Recurrent tumor diameter (\geq 3.5 vs. <3.5 cm)	2.576 (1.226–5.415)	0.033	3.112 (2.210–3.221)	0.245
Recurrence patterns ^a	2.289 (1.074–4.880)	0.032	4.713 (1.278–9.639)	0.032
PCI (\geq 8 vs. <8)	2.367 (1.176–4.767)	0.016	1.746 (1.017–3.250)	0.021
Treatment model (curative vs. palliative/unresectable)	0.251 (0.113–0.557)	0.001	0.361 (0.151–0.602)	0.035
Numbers of recurrent lesions (multiple vs. single)	3.705 (1.297–7.582)	0.014	1.115 (0.352–3.242)	0.635
CC score (1 vs. 0)	2.267 (1.144–4.493)	0.019	0.567 (0.121–1.656)	0.265

^a PM coupled with IHR/PM with synchronous extraperitoneal metastasis vs. PM only; IHR, Intrahepatic Recurrence. HR, hazard ratio; CI, confidence interval; BMI, body mass index; AFP, α -fetoprotein; PCI, Peritoneal Cancer Index; CC score, Completeness of Cytoreduction score.

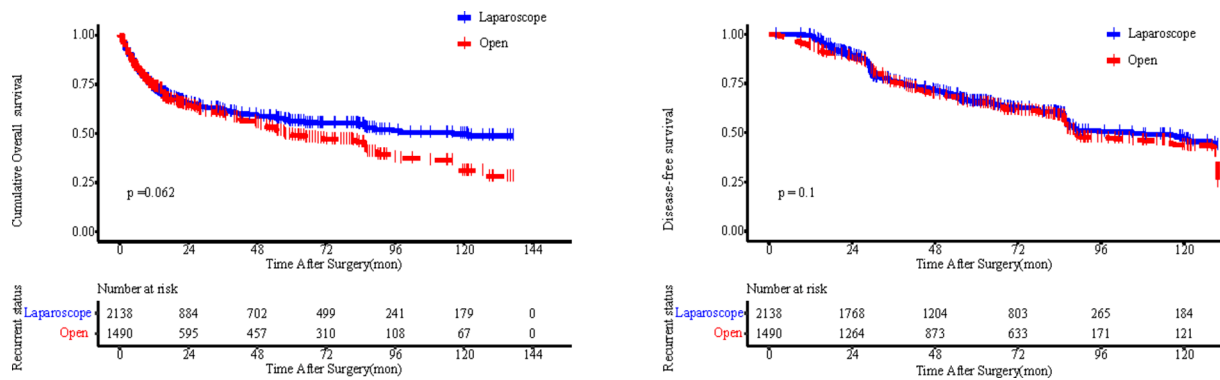


Figure S3 The overall survival and disease-free survival were comparable between the LH and OH patients. LH, laparoscopic hepatectomy; OH, open hepatectomy.