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Comparison of Health-Related Quality of Life After Pure Laparoscopic vs Open Donor Hepatectomy in a Low-Volume Living Donor Liver Transplantation Center: A Retrospective Cohort Study

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Background: Pure laparoscopic donor hepatectomy (PLDH) is increasingly adopted in living donor liver transplantation (LDLT) to enhance donor recovery. However, evidence on long-term health-related quality of life (HRQoL) following PLDRH is scarce, particularly in low-volume centers. This study aimed to compare perioperative outcomes and longitudinal HRQoL between PLDH and conventional open donor hepatectomy (CODH) in a single low-volume LDLT center.

Material/Methods: A retrospective cohort study was conducted between March 2010 and July 2023, including 50 living liver donors who underwent donor hepatectomy (27 CODH; 23 PLDH). Donor demographics, operative details, complications, and liver function test results were retrieved from the institutional database. HRQoL was assessed using the 36-Item Short Form Health Survey (SF-36) at 1, 3, 6, and 12 months postoperatively, prospectively administered during follow-up visits and retrospectively reviewed. Statistical analyses included the *t* test, Fisher exact test, Mann-Whitney U test, and repeated-measures ANOVA.

Results: Baseline characteristics were similar between groups except for higher education levels among PLDH donors ($P<0.001$). PLDH group showed a trend toward shorter hospital stay (6.83 vs 8.44 days; $P=0.055$). Postoperative complications and liver function test results were similar. PLDH donors reported significantly higher HRQoL scores in physical function, role physical, general health, and social function domains ($P<0.05$), with favorable trends in other domains.

Conclusions: In this low-volume LDLT center, PLDH demonstrated perioperative safety comparable to CODH, while achieving superior recovery in multiple HRQoL domains and reduced transfusion requirements. These findings support PLDH as the preferred donor approach when expertise is available.

Keywords: Hepatectomy • Laparoscopy • Liver Transplantation • Quality of Life • Retrospective Studies • Surgery

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Introduction

Liver transplantation remains the definitive therapy for end-stage liver disease and has evolved over the past decades into an internationally recognized standard of care [1]. In Thailand, living donor liver transplantation (LDLT) was initiated at our institution in 2010. By 2023, a total of 54 transplants had been performed. Because of the persistent shortage of deceased donor organs and sociocultural barriers to organ donation in northern Thailand, LDLT continues to be the primary graft source in our program [2].

To enhance donor safety and promote faster postoperative recovery, minimally invasive approaches have increasingly been adopted for donor hepatectomy. High-volume LDLT centers worldwide have demonstrated the feasibility, safety, and efficacy of pure laparoscopic donor hepatectomy (PLDH) [3]. However, most available evidence is derived from experienced, high-volume programs, and the generalizability of these results to centers with lower case volumes, constrained resources, or evolving training structures remains uncertain [4].

In 2022, our center became the first in Thailand and the second in Southeast Asia to establish a PLDH program. Compared with conventional open donor hepatectomy (CODH), PLDH has been associated with reduced postoperative pain, shorter hospital stays, and earlier return to daily activities [5,6]. Since its introduction, PLDH has progressively become the preferred approach at our center.

Despite these advantages, evidence on long-term health-related quality of life (HRQoL) following PLDH remains limited, particularly in low-volume LDLT settings. HRQoL is a multidimensional construct encompassing physical, psychological, and social well-being, and the 36-Item Short Form Health Survey (SF-36) is a validated instrument widely used to evaluate HRQoL in living liver donors [7].

The present study aimed to compare postoperative outcomes and longitudinal HRQoL in living liver donors who underwent PLDH or CODH at a single low-volume LDLT center in Thailand. To our knowledge, this report is the first in Thailand, and among the few worldwide, to provide long-term HRQoL outcomes in donors undergoing laparoscopic vs open donor hepatectomy in a low-volume context. These findings may help guide surgical decision-making and donor care strategies in centers with limited case volumes and resources.

Material and Methods

This retrospective cohort study compared perioperative outcomes and long-term HRQoL in living liver donors who underwent donor hepatectomy for LDLT. The institutional review board (IRB No. FAC-MED-2565-08848) approved the study, and the requirement for informed consent was waived due to the retrospective design.

All living liver donors who underwent hepatectomy for LDLT between March 2010 and July 2023 were included. No donors were excluded. Demographic, clinical, operative, and postoperative data were retrieved from the institutional electronic database.

Data Collection

Baseline characteristics included age, sex, blood group, marital status, education level, occupation, and donor-recipient relationship. Perioperative variables included operative time, intraoperative blood loss, transfusion requirements, postoperative complications, length of hospital stay, and laboratory investigations. Liver function test results were recorded preoperatively and at 1, 3, 6, and 12 months postoperatively. Postoperative complications were recorded according to standard clinical practice and were classified by Clavien-Dindo classification.

Surgical Procedure for Living Donor Hepatectomy

CODH was performed by a single surgeon (SJ) using a standardized inverted L-shaped incision. PLDH was introduced as the preferred approach in March 2020 and was offered to all eligible donors. Previously published selection criteria for PLDH were gradually expanded with increasing institutional experience. The techniques for CODH and PLDH are described in detail in our previous publications [5,6].

Quality of Life Assessment

HRQoL was assessed using the 36-Item Short Form Survey (SF-36), a validated instrument encompassing 8 domains and summarized into a Physical Component Summary (PCS) and Mental Component Summary (MCS). The Thai-language version of the SF-36, previously validated in Thai populations, was used [8]. HRQoL assessments were prospectively collected at 1, 3, 6, and 12 months after surgery. All donors were interviewed by a trained liver transplant nurse coordinator using a standardized questionnaire.

Statistical Analysis

Categorical data were analyzed using Fisher's exact test and are presented as numbers (percentages). Normally distributed continuous data are expressed as mean (standard deviation) and were compared using the *t* test, while non-normally distributed continuous data are presented as median (interquartile range) and were compared using the Mann-Whitney U test. A *P* value <0.05 was considered statistically significant for all analyses.

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Overall HRQoL across domains and time points was analyzed using repeated-measures ANOVA to assess changes over time. For comparisons of median scores between CODH and PLDH at each time point, the Mann-Whitney U test was applied. All statistical analyses were performed using STATA (StataCorp, College Station, TX, USA).

Results

Baseline Characteristics

A total of 50 consecutive LDLT donor hepatectomies were performed between March 2010 and July 2023. Of these, 27 donors underwent CODH and 23 underwent PLDH. No hybrid procedure such as hand-assisted or laparoscopic-assisted in our cohort. All donors completed the 12-month postoperative HRQoL assessment.

Baseline characteristics and graft types are summarized in **Table** 1. Overall, the 2 groups were comparable in demographic and clinical characteristics. The only significant difference observed was education level: a higher proportion of donors in the PLDH group had attained at least a bachelor's degree compared with the CODH group (82.61% vs 48.14%; *P*<0.01). No other baseline variables differed significantly between groups.

Perioperative Outcomes

Median estimated blood loss was lower in the PLDH group compared with the CODH group (400 vs 500 mL), although the difference did not reach statistical significance (*P*=0.21). The incidence of intraoperative blood transfusion and the median number of packed red cell units transfused were similarly comparable between groups (17.39% vs 18.52%; *P*=1.00; 0 vs 0 units, *P*=0.695). Overall complication rates, major complications, and length of hospital stay also did not differ significantly between the 2 approaches.

Donor liver function test results at baseline and at 1, 3, 6, and 12 months postoperatively are summarized in **Table 2**. Most laboratory parameters were comparable across the 2 groups throughout the follow-up period. However, small but statistically significant differences were noted in preoperative albumin (4.5 vs 4.6 g/dL; *P*=0.028), preoperative alanine aminotransferase (17.78 vs 13.27 U/L; *P*=0.007), preoperative direct bilirubin (0.13 vs 0.19 mg/dL; *P*=0.044), and direct bilirubin levels at 1 month postoperatively (0.23 vs 0.31 mg/dL; *P*=0.047).

HRQoL Assessment

HRQoL outcomes across all SF-36 domains are summarized in **Table 3**, and longitudinal trends of the physical component summary (PCS) and mental component summary (MCS) are illustrated in **Figures 1 and 2**, respectively. Overall, donors in the PLDH group demonstrated earlier and more sustained improvement across multiple physical and psychosocial domains compared with donors in the CODH group. Radar plots of longitudinal HRQoL after PLDH vs CODH further highlight these patterns: the PLDH group showed higher scores across most domains as early as 1 month postoperatively, with more pronounced differences emerging at 3 and 6 months, and persisting through 12 months (**Figure 3**).

Physical Component Summary

Physical function: Donors in the PLDH group had significantly higher physical function scores overall (adjusted β=22.45; 95% CI, 6.39-38.50; *P*=0.006). Although the difference at 1 month did not reach statistical significance (64.69±25.46 vs 45.63±33.61; *P*=0.081), significant differences emerged at 3 months (median 94.12 vs 52.94; *P*=0.021), 6 months (100 vs 75; *P*=0.003), and 12 months (100 vs 93.33; *P*=0.039).

Role physical: Donors in the PLDH group also had significantly greater improvement in role physical scores (adjusted β=27.60; 95% CI, 2.95-52.25; *P*=0.028). No difference was observed at 1 month (25 [0-75] vs 0 [0-25]; *P*=0.101). However, significantly higher scores were seen in the PLDH group at 3 months (100 [75-100] vs 0 [0-100]; *P*=0.017), 6 months (100 [100-100] vs 50 [0-100]; *P*=0.009), and 12 months (100 [25-100] vs 100 [0-100]; *P*=0.039).

Bodily pain: The overall difference was not statistically significant (adjusted β=7.67; 95% CI, -8.67 to 24.01; *P*=0.358). At 1 month, the groups were similar (60.13±23.59 vs 58.33±32.84; *P*=0.857). However, donors in the PLDH group reported significantly less pain at 3 months (78.68±18.10 vs 59.56±30.79; *P*=0.035), 6 months (100 [78.57-100] vs 57.14 [57.14-71.43]; *P*=0.014), and 12 months (100 [91.67-100] vs 66.67 [50-100]; *P*=0.017).

General health: General health scores favored the PLDH group over the course of follow-up, although the overall difference was not significant (adjusted β=14.70; 95% CI, -1.61 to 31.01; *P*=0.077). A significant difference was observed at 6 months (75.42±18.17 vs 55.69±26.24; *P*=0.018), while differences at 1 month (*P*=0.125), 3 months (*P*=0.119), and 12 months (91.67 [54.17-95.83] vs 58.33 [50-83.33]; *P*=0.083) did not reach significance.

Mental Component Summary

Social function: Donors in the PLDH group had significantly higher social function scores overall (adjusted β=22.41; 95% CI, 5.12-39.70; *P*=0.011). Differences were apparent at 1 month

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Table 1. Baseline characteristic of donors who underwent donor hepatectomy for living donor liver transplantation (LDLT) with conventional open donor hepatectomy (CODH) or pure laparoscopic donor hepatectomy (PLDH) (n=50).

Parameters	CODH (n=27)		P LDH (n=23)		*P* value
Sex, n (%)					
Male	11	(40.74)	5	(21.74)	0.225
Female	16	(59.26)	18	(78.26)	
Mean age, y (SD)	36.74	(10.63)	35.70	(11.77)	0.743
Blood group donor, n (%)					
A	5	(18.52)	4	(17.39)	
B	4	(14.81)	7	(30.43)	0.485
O	18	(66.67)	12	(52.17)	
AB	0		0		
Blood group recipient, n (%)					
A	7	(25.93)	5	(21.74)	
B	8	(29.63)	7	(30.43)	0.730
O	11	(40.74)	8	(34.78)	
AB	1	(3.70)	3	(13.04)	
Status, n (%)					
Single	10	(37.04)	9	(39.13)	0.614
Married	15	(55.56)	14	(60.57)	
Divorced	2	(7.41)	0		
Graduation, n (%)					
Grade 4	0		3	(13.04)	
Grade 6	5	(18.52)	1	(4.35)	
Certificate degree	9	(33.33)	0		<0.001
Bachelor's degree	11	(40.74)	18	(78.26)	
Master's degree	1	(3.70)	1	(4.35)	
Doctoral degree	1	(3.70)	0		
Occupation, n (%)					
Employee	13	(48.15)	15	(65.22)	0.328
Government	6	(22.22)	5	(21.74)	
Unemployed	8	(29.63)	3	(13.04)	
Relationship with recipient, n (%)					
Spouse	7	(25.93)	4	(17.39)	
Daughter	6	(22.22)	9	(39.13)	0.723
Son	10	(37.04)	6	(26.09)	
Siblings	2	(7.40)	1	(4.35)	
Parent	2	(7.41)	3	(13.04)	
Type of liver graft					
Right lobe	26	(96.29)	22	(95.65)	0.710
Left lobe	0		1	(4.35)	
Posterior section graft	1	(3.71)	0		
Clavien-Dindo classification, n (%)					
Grade I	1	(8.33)	1	(14.29)	
Grade II	6	(50.00)	2	(28.57)	0.947
Grade IIIa	2	(16.67)	1	(14.29)	
Grade IIIb	1	(8.33)	1	(14.29)	
Median blood loss, mL[IQR]	500	[400, 700]	400	[250, 700]	0.213
Perioperative blood transfusion, n (%)	5	(18.52)	4	(17.39)	1.000
Median packed red blood cells, units [IQR]	0	[0, 0]	0	[0, 0]	0.695
Median length of stay, days [IQR]	7	[6, 9]	7	[6, 7]	0.073

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Table 2. Comparison of perioperative liver function test results between conventional open donor hepatectomy (CODH) and pure laparoscopic donor hepatectomy (PLDH) groups (n=50).

Parameters	CODH (n=27)		PLDH (n=23)		*P* value
Total protein (g/dL)					
Preoperative, mean (SD)	7.60	(0.51)	7.80	(0.48)	0.166
1 Month, mean (SD)	7.59	(0.50)	7.53	(0.60)	0.738
3 Months, mean (SD)	7.76	(0.49)	7.48	(0.39)	0.116
6 Months, mean (SD)	7.75	(0.38)	7.64	(0.42)	0.485
12 Months, mean (SD)	7.75	(0.33)	7.61	(0.35)	0.263
Albumin (g/dL)					
Preoperative, median [IQR]	4.5	[4.2, 4.7]	4.6	[4.4, 4.17]	0.028
1 Month, median [IQR]	4.2	[3.8, 4.2]	4.1	[3.9, 4.3]	0.823
3 Months, mean (SD)	4.24	(0.36)	4.25	(0.37)	0.941
6 Months, median [IQR]	4.2	[4.1, 4.4]	4.3	[4.1, 4.5]	0.617
12 Months, mean (SD)	4.44	(0.23)	4.35	(0.25)	0.321
Alkaline phosphatase (U/L)					
Preoperative, median [IQR]	60	[51, 65]	59	[51, 72]	0.838
1 Month, mean (SD)	99.59	(37.46)	104.61	(37.40)	0.559
3 Months, median [IQR]	79.5	[58, 101]	77	[70, 90]	0.729
6 Months, median [IQR]	69	[62, 86]	80	[66, 97]	0.579
12 Months, mean (SD)	69.7	(23.87)	70.2	(19.77)	0.948
AST (U/L)					
Preoperative, mean (SD)	17.70	(3.79)	16.95	(3.15)	0.463
1 Month, median [IQR]	30	[25, 34]	30.5	[25, 38]	0.681
3 Months, median [IQR]	24	[20, 28]	24	[21, 30]	0.624
6 Months, mean (SD)	19.36	(4.63)	21.62	(5.78)	0.310
12 Months, mean (SD)	20.5	(5.11)	17.93	(2.96)	0.092
ALT (U/L)					
Preoperative, mean (SD)	17.78	(6.65)	13.27	(3.69)	0.007
1 Month, median [IQR]	26	[20, 40]	29.5	[24, 38]	0.454
3 Months, median [IQR]	19	[14, 29]	23	[18, 26]	0.693
6 Months, median [IQR]	15	[11, 16]	14	[14, 17]	0.810
12 Months, median [IQR]	16	[12.5, 19.5]	13	[11, 15]	0.086
Total bilirubin (mg/dL)					
Preoperative, mean (SD)	0.41	(0.18)	0.49	(0.21)	0.152
1 Month, median [IQR]	0.46	[0.38, 0.69]	0.56	[0.43, 0.62]	0.226
3 Months, median [IQR]	0.59	[0.38, 0.76]	0.49	[0.44, 0.68]	0.858
6 Months, median [IQR]	0.57	[0.44, 0.61]	0.49	[0.3, 0.76]	0.449
12 Months, median [IQR]	0.47	[0.38, 0.67]	0.53	[0.37, 0.65]	0.898
Direct bilirubin (mg/dL)					
Preoperative, median [IQR]	0.13	[0.12, 0.18]	0.19	[0.14, 0.22]	0.044
1 Month, median [IQR]	0.23	[0.19, 0.27]	0.31	[0.23, 0.38]	0.047
3 Months, mean (SD)	0.24	(0.08)	0.26	(0.12)	0.682
6 Months, median [IQR]	0.19	[0.16, 0.24]	0.19	[0.16, 0.25]	0.787
12 Months, mean (SD)	0.20	(0.06)	0.21	(0.08)	0.607

AST – aspartate aminotransferase; ALT – alanine aminotransferase.

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Table 3. Comparison of quality of life outcomes across all SF-36 domain between conventional open donor hepatectomy (CODH) and pure laparoscopic donor hepatectomy (PLDH) groups (n=50).

Parameters	CODH (n=27)	PLDH (n=23)	*P* value
Physical component summary			
Physical function			
1 Month, mean (SD)	45.63 (33.61)	64.69 (25.46)	0.081
3 Months, median [IQR]	52.94 [29.41, 88.24]	94.12 [70.59, 94.12]	0.021
6 Months, median [IQR]	75 [56.25, 93.75]	100 [90.93, 100]	0.003
12 Months, median [IQR]	93.33 [73.33, 100]	100 [96.67, 100]	0.039
Role physical			
1 Month, median [IQR]	0 [0, 25]	25 [0, 75]	0.101
3 Months, median [IQR]	0 [0, 100]	100 [75, 100]	0.017
6 Months, median [IQR]	50 [0, 100]	100 [100, 100]	0.009
12 Months, median [IQR]	100 [0, 100]	100 [100, 100]	0.039
Bodily pain			
1 Month, mean (SD)	58.33 (32.84)	60.13 (23.59)	0.857
3 Months, mean (SD)	59.56 (30.79)	78.68 (18.10)	0.035
6 Months, median [IQR]	57.14 [57.14, 71.43]	100 [78.57, 100]	0.014
12 Months, median [IQR]	66.67 [50, 100]	100 [91.67, 100]	0.017
General health			
1 Month, mean (SD)	55.47 (28.22)	69.12 (21.25)	0.125
3 Months, mean (SD)	54.12 (28.37)	68.24 (22.67)	0.119
6 Months, mean (SD)	55.69 (26.24)	75.42 (18.17)	0.018
12 Months, median [IQR]	58.33 [50, 83.33]	91.67 [54.17, 95.83]	0.083
Mental component summary			
Social function			
1 Month, mean (SD)	59.82 (29.15)	71.43 (25.75)	0.234
3 Months, median [IQR]	60 [20, 60]	100 [80, 100]	0.002
6 Months, median [IQR]	50 [25, 100]	100 [75, 100]	0.015
12 Months, median [IQR]	80 [60, 100]	100 [100, 100]	0.008
Vitality			
1 Month, mean (SD)	42.19 (20.98)	48.90 (26.35)	0.427
3 Months, mean (SD)	35.78 (24.96)	51.96 (25.44)	0.070
6 Months, mean (SD)	49.77 (24.34)	62.98 (29.22)	0.167
12 Months, mean (SD)	44.12 (21.81)	64.17 (32.32)	0.056
Role emotion			
1 Month, mean (SD)	62.5 (41.94)	68.63 (34.30)	0.648
3 Months, median [IQR]	66.67 [33.33, 100]	100 [100, 100]	0.057
6 Months, median [IQR]	100 [33.33, 100]	100 [100, 100]	0.026
12 Months, median [IQR]	100 [66.67, 100]	100 [100, 100]	0.489
Mental health			
1 Month, mean (SD)	62.83 (27.07)	68.11 (23.57)	0.554
3 Months, mean (SD)	53.78 (30.42)	68.91 (23.41)	0.114
6 Months, mean (SD)	56.86 (27.83)	65.10 (32.66)	0.440
12 Months, mean (SD)	59.80 (27.20)	74.31 (27.17)	0.169
Reported health transition			
1 Month, mean (SD)	39.06 (27.34)	41.18 (24.91)	0.818
3 Months, mean (SD)	38.24 (23.58)	48.53 (25.72)	0.233
6 Months, median [IQR]	50 [25, 50]	50 [50, 75]	0.009
12 Months, median [IQR]	50 [50, 75]	75 [50, 100]	0.086

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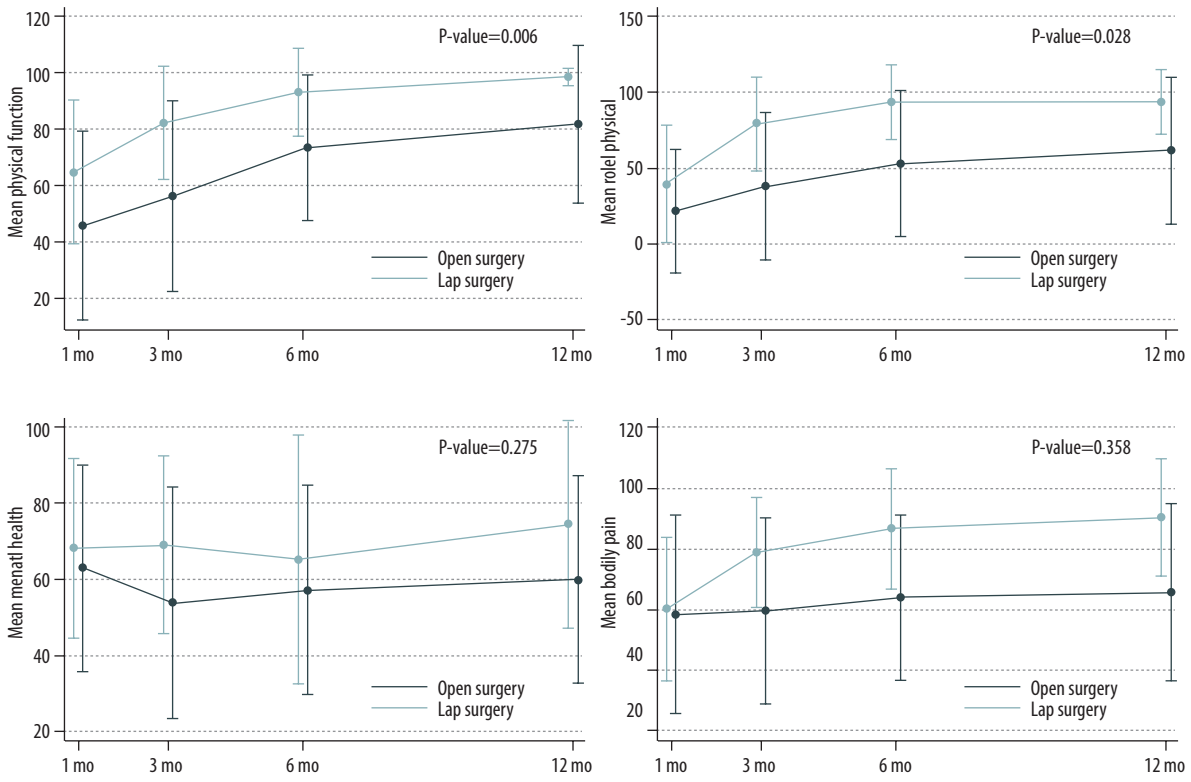

Figure 1. Longitudinal health-related quality of life in physical component summary after pure laparoscopic vs open donor hepatectomy.

(71.43±25.75 vs 59.82±29.15) and became more pronounced thereafter. From 3 months to 12 months, median scores in the PLDH group consistently reached 100, whereas scores in the CODH group remained lower (3 months: 100 [75-100] vs 60 [20-60]; 6 months: 100 [100-100] vs 50 [25-100]; 12 months: 100 [100-100] vs 80 [60-100]).

Vitality: The overall difference was not significant (adjusted β=9.36, 95% CI, -6.60 to 25.32; *P*=0.250). Mean scores favored the PLDH group across all time points, but differences did not reach statistical significance.

Role emotional: Although overall differences did not reach statistical significance (adjusted β=18.63, 95% CI, -3.44 to 40.70; *P*=0.098), donors in the PLDH group showed significantly higher scores at 6 months (*P*=0.018). Differences at 1 month (*P*=0.648), 3 months (*P*=0.057), and 12 months (*P*=0.487) were not statistically significant.

Mental health: Mental health scores favored the PLDH group at all time points, but the overall association did not achieve significance (adjusted β=9.68, 95% CI, -7.69 to 27.05; *P*=0.275).

Reported health transition: The overall difference was not significant (adjusted β=6.43, 95% CI, -7.84 to 20.71; *P*=0.377). Median scores favored the PLDH group at all time points, reaching significance only at 6 months (*P*=0.009). At 1 month (*P*=0.818), 3 months (*P*=0.233), and 12 months (*P*=0.086), differences were not significant.

Discussion

Donor safety and long-term HRQoL are central ethical issues for LDLT practice, as living donors are healthy individuals exposed to significant surgical risk without direct medical benefit. In this context, minimally invasive donor hepatectomy has the potential to improve donor experience without compromising graft or recipient outcomes. Our single-center study from a low-volume LDLT center provides compelling evidence that PLDH is associated with comparable perioperative outcomes and superior recovery in selected HRQoL domains compared with CODH. These findings are consistent with those reported from high-volume centers and reinforce the feasibility of implementing PLDH even in resource-limited environments [7,9].

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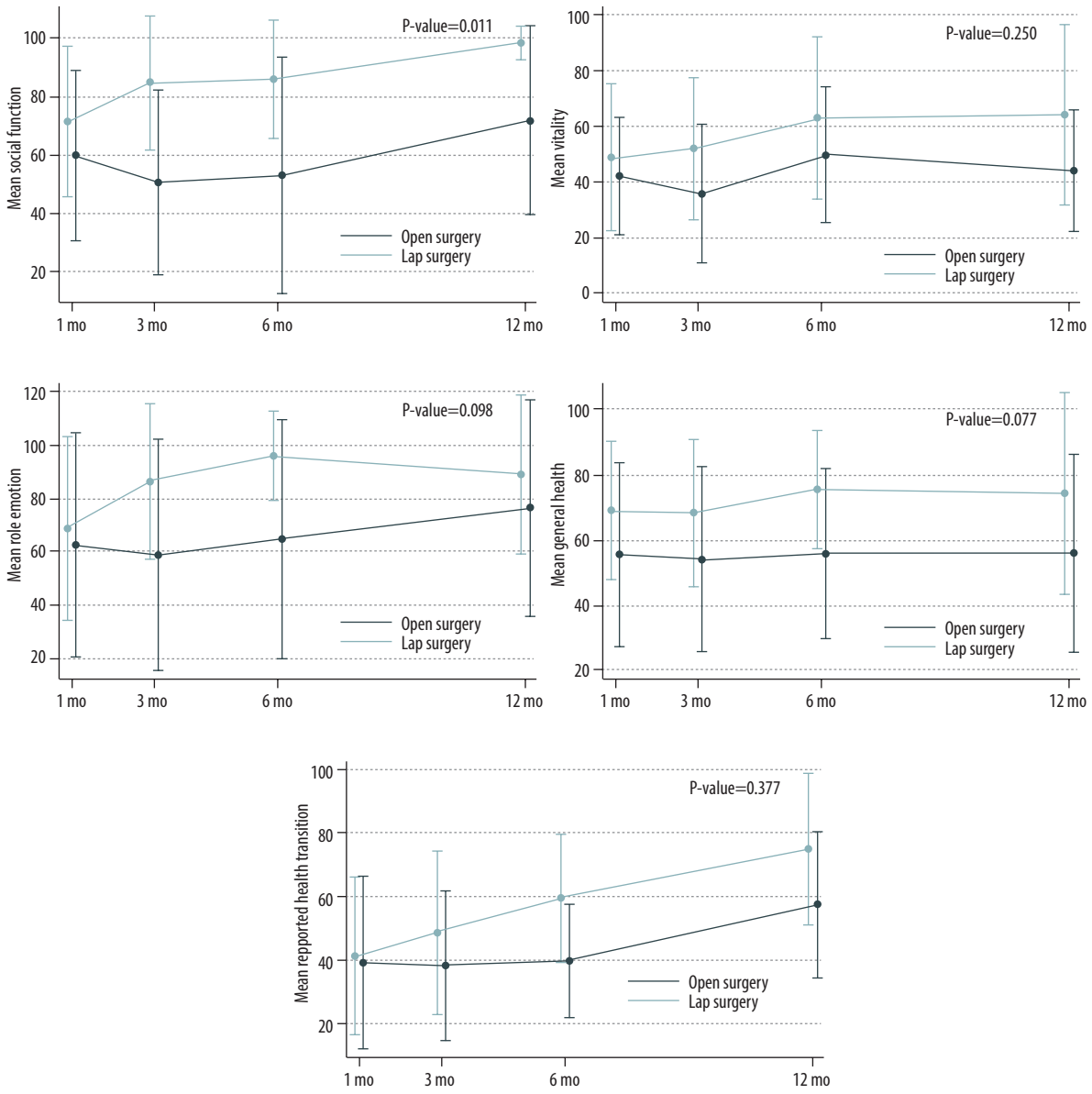

Figure 2. Longitudinal health-related quality of life in mental component summary after pure laparoscopic vs open donor hepatectomy.

The perioperative recovery status favored PLDH, with lower estimated blood loss, fewer transfusions, and shorter length of stay. These patterns align with the recognized benefits of a minimally invasive approach [10]. Our HRQoL findings further strengthen the donor benefits of PLDH. Donors undergoing PLDH demonstrated earlier and more sustained improvements in multiple PCS domains, particularly physical function, role physical, and bodily pain. These domains are closely related to postoperative mobility, independence, and early return to daily activities. The persistent superiority of PLDH across follow-up evaluations suggests a meaningful effect on functional recovery. These results suggested that PLDH may facilitate faster physical recovery and social reintegration, echoing prior literature on the donor-centered benefits of laparoscopy [11,12].

In contrast, improvements in MCS domains were less pronounced and mostly nonsignificant, although trends generally favored PLDH. This pattern is not unexpected. Psychological recovery often evolves more slowly and is influenced by complex factors such as donor-recipient relationship, postoperative recipient course, family dynamics, economic burden, and donor expectations [13]. MCS is sensitive to psychosocial

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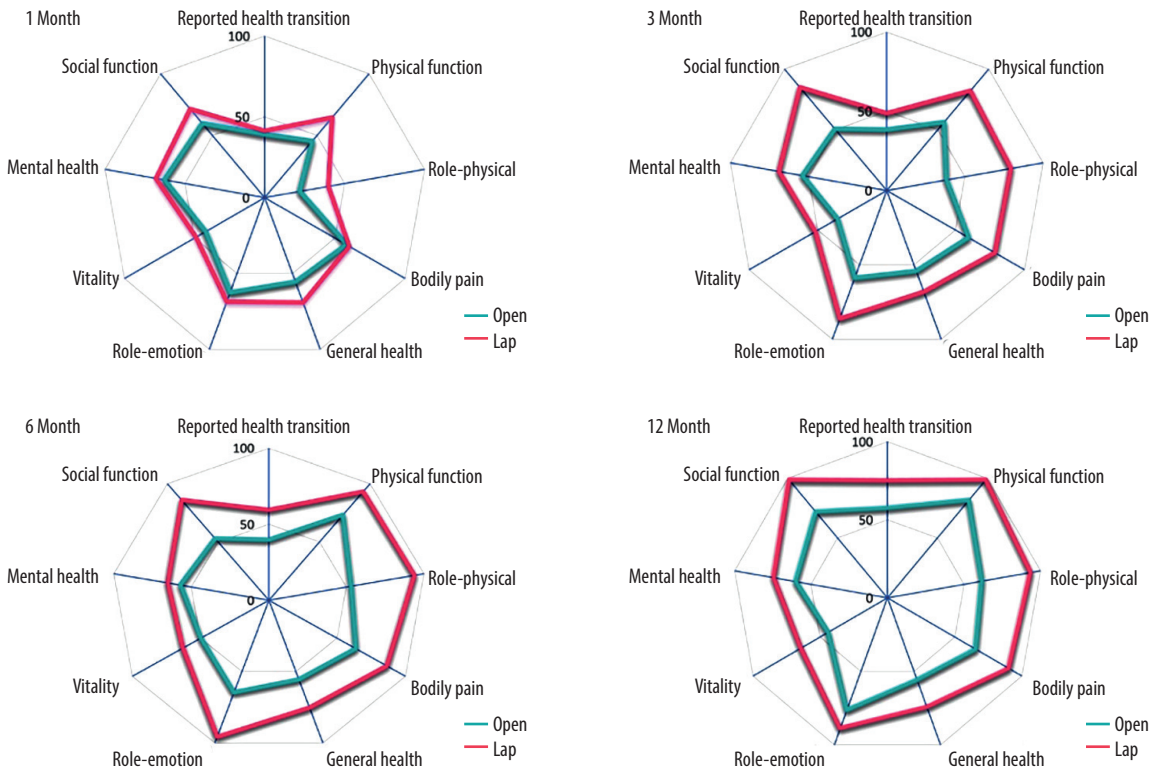

Figure 3. Radar plot of longitudinal health-related quality after pure laparoscopic vs open donor hepatectomy.

and contextual determinants that may not be fully captured in standard perioperative datasets. Ogawa et al also found that recipient outcomes and lower donor educational attainment were associated with delayed MCS recovery at 1 year [7]. These observations align with our study, in which higher education was more prevalent among PLDH donors and could partially confound MCS comparisons. Future studies should integrate validated psychosocial and economic assessments, to better delineate contributors to mental health recovery after donation.

Most early adopters of PLDH have been high-volume centers with specialized expertise, where favorable donor outcomes are well documented [14]. Current consensus statements recommend that PLDH initially be limited to centers with strong hepatobiliary and laparoscopic experience, with surgeons undergoing structured training and proctoring [15]. Our earlier experience demonstrated that, with careful team preparation, pure laparoscopic donor right hepatectomy can be implemented safely even in low-volume centers [5]. The present study extends this by showing that the benefits of PLDH on donor HRQoL persist long after the early postoperative period. As such, our findings may serve as a model for similar programs across Southeast Asia and other emerging transplant regions where access to minimally invasive donor surgery remains limited.

Several important limitations must be acknowledged. First, this study was a single-center, retrospective analysis with inherent selection and information biases. Second, the relatively small sample size limited statistical power and precluded robust multivariable adjustment. Notably, donors undergoing PLDH had a higher educational level, which may be a potential confounder, particularly for psychosocial HRQoL domains. However, the most consistent and statistically significant differences observed in this study were confined to the physical domains of HRQoL, which are less likely to be influenced by educational attainment alone. Mental and psychosocial domains were interpreted cautiously. Third, HRQoL assessments relied on self-reporting, which may be subject to response bias. Lastly, broader psychosocial factors influencing donor recovery were not systematically assessed. Despite these limitations, our study contributes meaningful evidence to the expanding global experience with PLDH. It highlights that even in a low-volume center, PLDH can be performed safely and may confer significant advantages in functional and social recovery.

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Conclusions

In a low-volume LDLT center, PLDH is a feasible and safe approach that offers comparable perioperative outcomes and superior long-term HRQoL in selected domains, compared with CODH. These findings reinforce the value of laparoscopic techniques in expanding donor-centered care and may guide similar institutions in adopting PLDH programs. Future multicenter, prospective studies with larger sample sizes and integrated psychosocial metrics from low-volume centers are needed to validate and expand upon these findings.

Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

References:

1. Gadour E. Lesson learnt from 60 years of liver transplantation: Advancements, challenges, and future directions. World J Transplant. 2025;15(1):93253
2. Lapisatepun W, Chotirosniramit A, Udomsin K, et al. Around the world: Adult living donor liver transplantation in Thailand. Transplantation. 2022;106(3):421-24
3. Marubashi S, Nagano H. Laparoscopic living-donor hepatectomy: Review of its current status. Ann Gastroenterol Surg. 2021;5(4):484-93
4. Yeow M, Soh S, Starkey G, et al. A systematic review and network meta-analysis of outcomes after open, mini-laparotomy, hybrid, totally laparoscopic, and robotic living donor right hepatectomy. Surgery. 2022;172(2):741-50
5. Lapisatepun W, Junrungsee S, Chotirosniramit A, et al. Comparative outcomes of pure laparoscopic and open donor right hepatectomy: the first report from a Southeast Asian transplant center. BMC Surg. 2022;22(1):48
6. Lapisatepun W, Junrungsee S, Lapisatepun W. Pure laparoscopic donor right hepatectomy for rare non-bifurcation portal vein variation donor and reconstruction technique. J Gastrointest Surg. 2023;27(9):2011-13
7. Ogawa K, Sakamoto K, Takada Y. Long-term health-related quality of life of living liver donors: What should the transplant team know? Hepatobiliary Surg Nutr. 2021;10(3):394-96
8. Udomsin K, Lapisatepun W, Chotirosniramit A, et al. Adult-to-adult living donor liver transplantation: Postoperative outcomes and quality of life in liver donors: First report in Thailand. Transplant Proc. 2019;51(8):2761-65
9. He K, Pan Y, Wang H, et al. Pure laparoscopic living donor hepatectomy with/without fluorescence-assisted technology and conventional open procedure: A retrospective study in Mainland China. Front Surg. 2021;8: 771250.
10. Hong SK, Kim JY, Lee J, et al. Pure laparoscopic donor hepatectomy: Experience of 556 cases at Seoul National University Hospital. Am J Transplant. 2024;24(2):222-38
11. Soubrane O, Eguchi S, Uemoto S, et al. Minimally invasive donor hepatectomy for adult living donor liver transplantation: An international, multi-institutional evaluation of safety, efficacy and early outcomes. Ann Surg. 2022;275(1):166-74
12. Yang JD, Lee KW, Kim JM, et al. A comparative study of postoperative outcomes between minimally invasive living donor hepatectomy and open living donor hepatectomy: The Korean organ transplantation registry. Surgery. 2021;170(1):271-76
13. Cho CW, Choi GS, Kim JM, et al. Postoperative health status and quality of life after pure laparoscopic donor hepatectomy for living donor liver transplantation. Ann Transplant. 2022;27:e935611
14. Ziogas IA, Kakos CD, Moris DP, et al. Systematic review and meta-analysis of open versus laparoscopy-assisted versus pure laparoscopic versus robotic living donor hepatectomy. Liver Transpl. 2023;29(10):1063-78
15. Cherqui D, Ciria R, Kwon CHD, et al. Expert consensus guidelines on minimally invasive donor hepatectomy for living donor liver transplantation from innovation to implementation: A joint initiative from the International Laparoscopic Liver Society (ILLS) and the Asian-Pacific Hepato-Pancreato-Biliary Association (A-PHPBA). Ann Surg. 2021;273(1):96-108

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