

# Trans-arterial positive ICG staining-guided laparoscopic anatomic liver resection basedon portal territory for hepatocellular carcinoma

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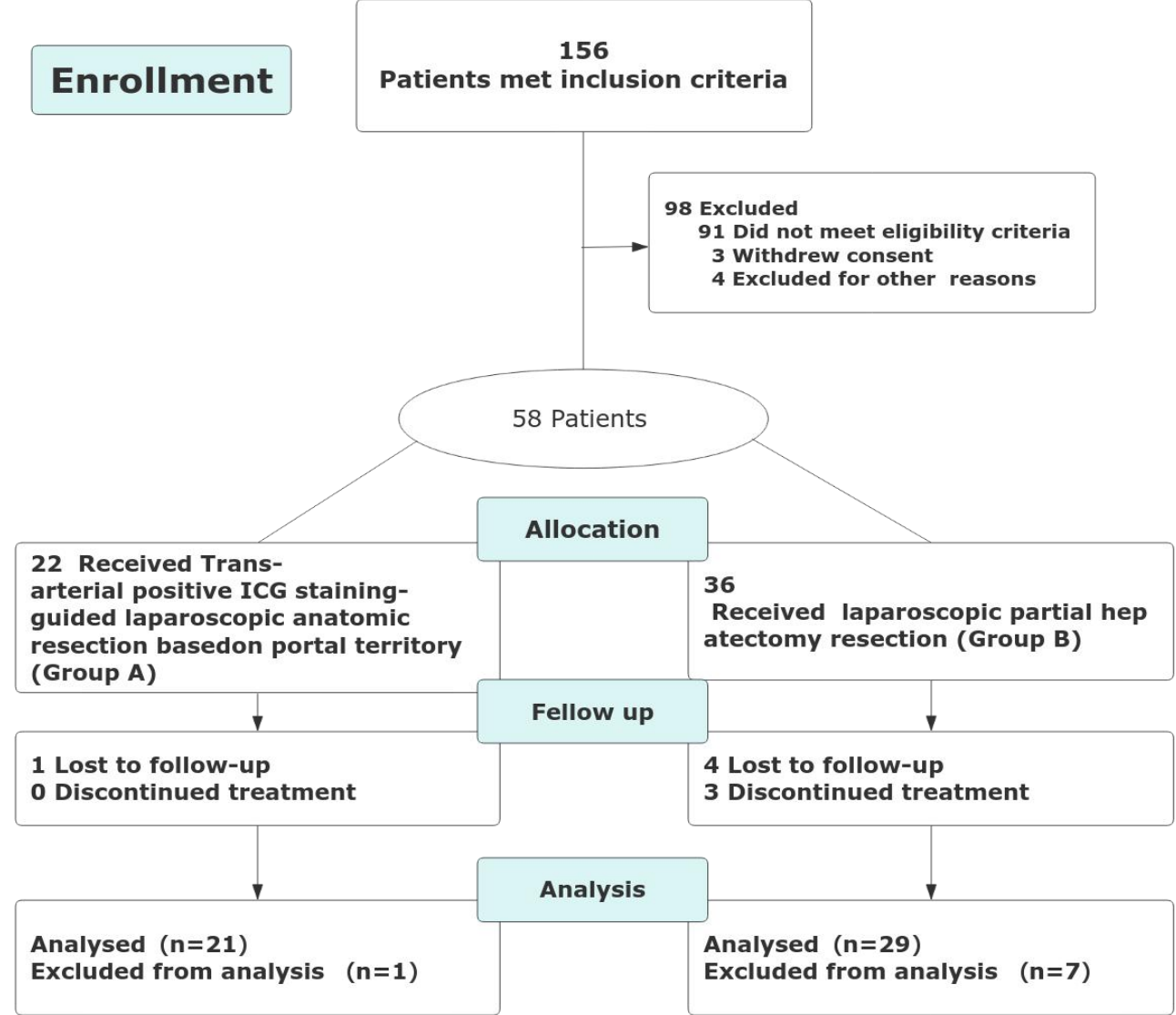
Introduction

- Anatomic liver resection** aiming for the complete removal of the tumor-bearing portal territory (PT) is the optimal treatment for resectable hepatocellular carcinoma (HCC) patients.
- Given the concurrent course of the hepatic artery and portal vein, **arterial territory resection** can substitute for portal territory resection, enabling complete anatomic resection of the tumor-bearing territory.
- This study aims to explore the application of **trans-arterial indocyanine green (ICG) fluorescence staining**-guided laparoscopic anatomic liver resection based on portal territory and to preliminarily assess its safety and efficacy.

Methods

- Participants: Trans-arterial positive ICG staining-guided laparoscopic anatomic liver resection basedon portal territory (**Group A** : 21 patients) VS laparoscopic partial hepatectomy(**Group B** : 29 patients)
- Inclusion Criteria: Age 18-75 years, any gender.Good overall condition, no contraindications for DSA and laparoscopic liver resection; BCLC stage 0-A, maximum tumor diameter ≤ 5 cm, no major vascular invasion or tumor thrombus, no intrahepatic or extrahepatic metastasis.
- Exclusion Criteria: Prior conversion therapy including chemotherapy, radiotherapy, targeted therapy, or immune checkpoint inhibitors.Recurrent HCC

Figure 1. Study design



Patient characteristics: Table 1.

	Group A N=21	Group B N=29	p.overall
Sex:			0.741
Female	4 (19.0%)	7 (24.1%)	
Male	17 (81.0%)	22 (75.9%)	
Age(years)	54.0 (10.7)	58.9 (12.6)	0.153
AFP	5.14[2.49;55.3]	4.17 [2.41;23.6]	0.414
PIVKA-II	81.6 [35.0;213]	44.3 [28.5;183]	0.443
BCLC grade:			0.111
0	0 (0.00%)	3 (10.3%)	
A	21(100.0%)	26(89.7%)	
HBsAg:			0.441
Positive	19 (90.5%)	23 (79.3%)	
Negative	2 (9.52%)	6 (20.7%)	
ASA grade			0.733
1	12(57.1%)	18(62.1%)	
2	9(42.9%)	11(37.9%)	
Cirrhosis:			0.443
Yes	14 (66.7%)	15 (51.7%)	
NO	7 (33.3%)	14 (48.3%)	
Child grade:			0.129
0	0 (0.00%)	4 (13.8%)	
A	21 (100%)	24 (82.8%)	
B	0 (0.00%)	1 (3.45%)	
Albumin	41.2 (2.67)	41.1 (4.27)	0.948
Tumour size (cm)	2.60 (1.07)	2.96 (1.03)	0.240
Differentiated degree:			0.582
Highly	1 (4.76%)	3 (10.3%)	
Moderately	18 (85.7%)	25 (86.2%)	
Poorly	2 (9.52%)	1 (3.45%)	

Result:

Intraoperative Findings:

- Clear visualization** of intersegmental planes. (Figure 2)
  - Enhanced precision** in segmental resection (Figure 3)
  - Shorter portal clamp time**: 40 (38.5-68.5) vs 50 (45-67.5) min; P=0.013. (Table 2)
  - Less intraoperative blood loss**: 100 (50-200) vs 150 (100-200) ml; P=0.031. (Table 2)
- Postoperative Outcomes:
- No significant difference in postoperative complications.
  - Higher 1-year and 2-year Disease-Free Survival (DFS) in the Group A: 80.96% and 66.66% vs 68.97% and 58.62% in the Group (P=0.52). (Figure 3)

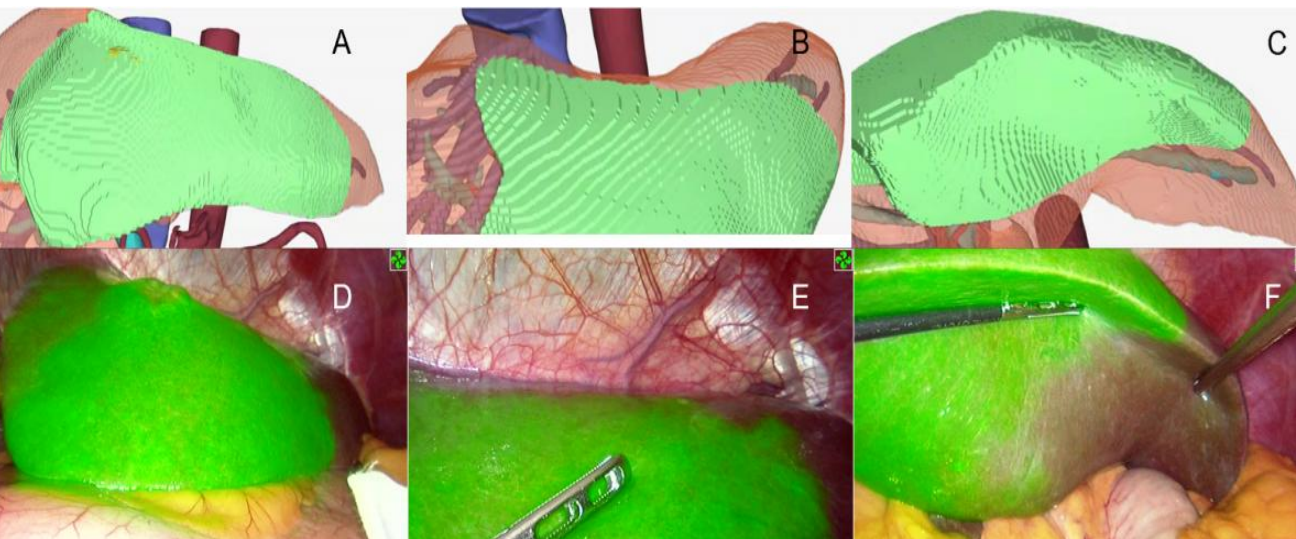


Figure 2. A, B, C: **Three-dimensional visualization** of surgical planning based on preoperative CT imaging data, with green indicating the segment to be resected. D, E, F: Intraoperative **real-time fluorescence imaging**, with green indicating the segment to be resected.

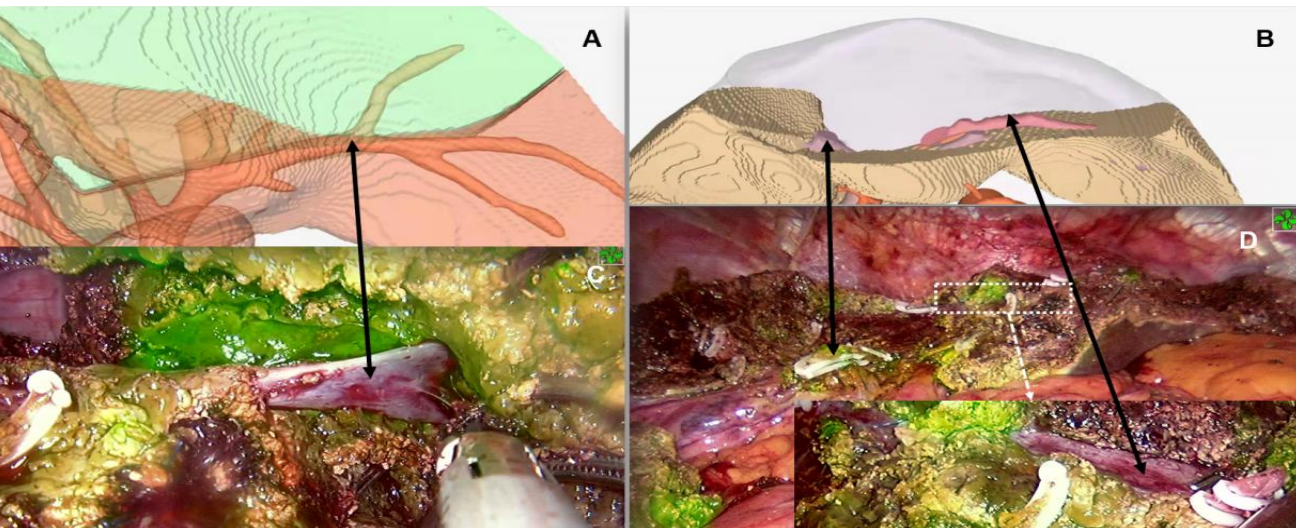


Figure 3. The resected liver surface, guided by fluorescence navigation, is **highly consistent with** the **three-dimensional** surgical plan.

	Group A N=21	Group B N=29	p.overall
Postoperativehospital stay (days)	7.05±1.93	7.90±3.255	0.103
Duration of operation (min)	307(209-397)	311(226.5-355.5)	0.321
Postoperative time to first flatus (days)	2.29±0.561	2.38±0.494	0.604
Hepatic inflowocclusion applied (min)	40 (38.5-68.5)	50 (45-67.5)	0.013
Blood transfusion	1 (4.76%)	3 (10.34%)	0.63
Blood loss (ml)	100 (50-200)	150 (100-200)	0.031
Resection margin (cm)	1 (0.5-1.45)	1 (0.4-1.3)	0.22
Ki67	20 (10-40)	25 (13.5-40)	0.578

Table 2.Intraoperative and postoperative data

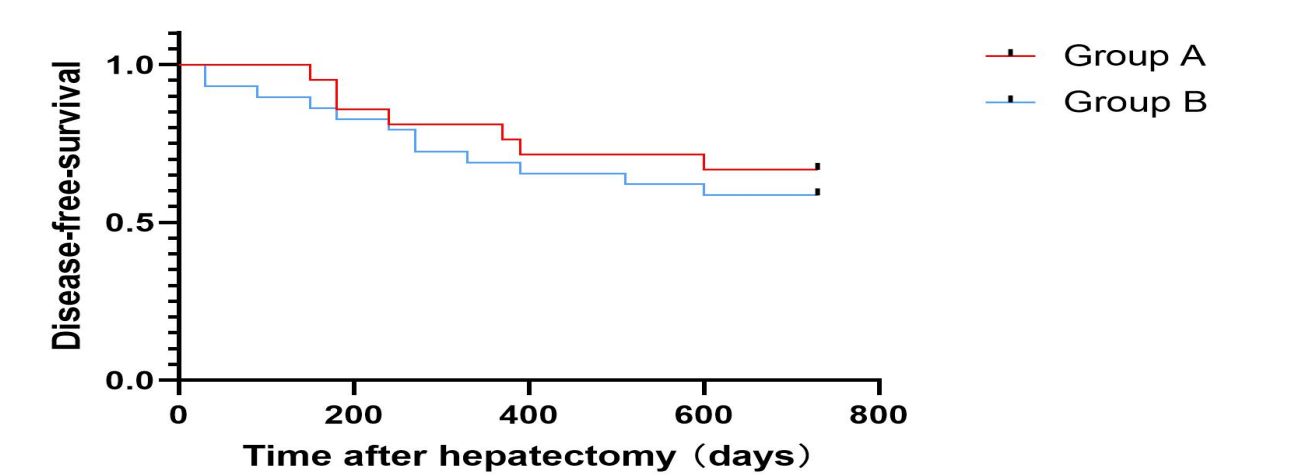


Figure 3.Disease-Free Survival (DFS)

Conclusion

This study demonstrates that **Trans-arterial positive ICG staining-guided** laparoscopic anatomic liver resection based on portal territory for hepatocellular carcinoma is **safe and feasible**. It can minimize surgical trauma without compromising the therapeutic effectiveness of **anatomic liver resection**.