

Evolving liver surgery: Techniques, outcomes, and complexities.

Fatima Rahman*

Department of Hepatobiliary Surgery, Karachi Medical University, Karachi, Pakistan

Introduction

This article discusses the evolution and current state of minimally invasive liver surgery, highlighting its benefits like reduced blood loss and shorter hospital stays. It explores various techniques, including laparoscopy and robotics, and touches upon future directions such as enhanced imaging and artificial intelligence integration. The focus is on expanding indications and improving outcomes for complex liver resections [1].

This systematic review evaluates contemporary surgical approaches for intrahepatic cholangiocarcinoma, detailing various resection techniques and their impact on patient outcomes. It emphasizes the importance of R0 resection and lymphadenectomy while discussing emerging neoadjuvant and adjuvant therapies in conjunction with surgery. The review provides insights into improving resectability and long-term survival for this aggressive cancer [2].

This article comprehensively reviews the role of liver transplantation in treating hepatocellular carcinoma, particularly focusing on expanding criteria beyond Milan. It delves into prognostic factors, neoadjuvant treatments, and the management of recurrence post-transplant, offering insights into optimizing patient selection and improving long-term survival for this complex patient population [3].

This review article outlines the current strategies for managing perihilar cholangiocarcinoma, a highly challenging malignancy. It covers the importance of accurate preoperative staging, meticulous surgical resection with negative margins, and various reconstruction techniques. The discussion also includes the role of neoadjuvant and adjuvant therapies and future prospects in multidisciplinary management to improve patient outcomes [4].

This systematic review and meta-analysis assesses the safety and efficacy of laparoscopic major hepatectomy for various liver pathologies. It aggregates data from thousands of patients, demonstrating favorable outcomes in terms of reduced blood loss, shorter hospital stays, and comparable oncologic results when compared to open surgery. The analysis underscores the increasing adoption and maturity of this minimally invasive approach for complex resections [5].

This contemporary review explores the current surgical strategies for gallbladder cancer, emphasizing the importance of radical cholecystectomy with lymphadenectomy and liver bed resection based on disease stage. It discusses various surgical approaches, including minimally invasive options, and the role of adjuvant therapies. The article aims to guide surgeons in optimizing treatment plans to improve survival rates for this often-aggressive malignancy [6].

This systematic review and meta-analysis examines the efficacy and safety of preoperative portal vein embolization (PVE) in patients undergoing major hepatectomy for primary and metastatic liver tumors. It highlights PVE's crucial role in inducing hypertrophy of the future liver remnant, thereby reducing the risk of post-hepatectomy liver failure. The study synthesizes evidence on patient selection, technical success rates, and clinical outcomes, affirming PVE as a standard procedure in complex liver surgery [7].

This review focuses on the evolving surgical management of colorectal liver metastases, which are often curable with aggressive approaches. It discusses patient selection, the role of multidisciplinary teams, and various surgical strategies including two-stage hepatectomy and combination with ablative techniques. The article emphasizes improving resectability rates and achieving long-term survival for patients with this common metastatic disease [8].

This systematic review and meta-analysis evaluates the safety and feasibility of robot-assisted surgery across various hepatobiliary and pancreatic procedures. It highlights the benefits of robotic platforms, such as enhanced dexterity and 3D visualization, which are particularly advantageous in complex resections and reconstructions. The review synthesizes current evidence on perioperative outcomes, complication rates, and oncologic efficacy, supporting the growing role of robotics in specialized HPB surgery [9].

This review explores the critical role of intraoperative imaging techniques in liver surgery, focusing on their utility in precise tumor localization, vascular and biliary anatomy delineation, and margin assessment. It discusses various modalities, including intraoperative ultrasound, fluorescence imaging with indocyanine green, and emerging augmented reality platforms, highlighting how these technologies enhance surgical precision and improve patient safety and oncological outcomes [10].

*Correspondence to: Fatima Rahman, Department of Hepatobiliary Surgery, Karachi Medical University, Karachi, Pakistan. E-mail: fatima.rahman@karachimed.pk

Received: 04-Sep-2025, Manuscript No. aaasr-226; Editor assigned: 08-Sep-2025, Pre QC No. aaasr-226 (PQ); Reviewed: 26-Sep-2025, QC No. aaasr-226; Revised: 07-Oct-2025, Manuscript No. aaasr-226 (R); Published: 16-Oct-2025, DOI: 10.35841/2591-7765-9.4.226

Conclusion

Liver surgery is rapidly evolving, with a strong focus on minimally invasive techniques like laparoscopy and robotics, which offer benefits such as reduced blood loss and shorter hospital stays [1, 5, 9]. These advanced approaches are improving patient outcomes across various complex liver resections. Strategies for aggressive malignancies, including intrahepatic and perihilar cholangiocarcinoma, emphasize meticulous surgical resection, R0 margins, and the integration of neoadjuvant and adjuvant therapies [2, 4]. Liver transplantation is crucial for hepatocellular carcinoma, with ongoing efforts to expand selection criteria and manage recurrence for improved long-term survival [3]. For gallbladder cancer, radical cholecystectomy combined with lymphadenectomy and liver bed resection is vital, while colorectal liver metastases often benefit from aggressive surgical management, including two-stage hepatectomy, to achieve long-term survival [6, 8]. Preoperative techniques such as portal vein embolization are standard for inducing liver hypertrophy, reducing post-hepatectomy failure risks [7]. Intraoperative imaging, including ultrasound and fluorescence, is essential for precise tumor localization, anatomical delineation, and margin assessment, enhancing surgical accuracy and patient safety [10]. Overall, these advancements are driving better outcomes in complex liver pathologies.

References

1. Zhang B, Huang Z, Li J. Minimally Invasive Liver Surgery: *Current Status and Future Perspectives*. *Front Oncol*. 2022;12:833010.
2. Wang D, Liu Y, Long J. Current surgical strategies for intrahepatic cholangiocarcinoma: a systematic review. *Updates Surg*. 2023;75:443-455.
3. Mazzaferro V, Citterio D, Bhoori S. Liver transplantation for hepatocellular carcinoma: current status and future perspectives. *J Hepatol*. 2019;70:1293-1304.
4. Kawachi Y, Miura T, Ito H. *Current management of perihilar cholangiocarcinoma*. *Jpn J Clin Oncol*. 2021;51:169-178.
5. Guo J, Li J, Wu X. Laparoscopic major hepatectomy: a systematic review and meta-analysis of outcomes in 5,593 patients. *Surg Endosc*. 2020;34:186-196.
6. Pandey V, Sharma A, Chaudhari R. Surgical management of gallbladder cancer: a contemporary review. *World J Surg Oncol*. 2022;20:15.
7. Xiong Y, Wang S, Fu Q. Preoperative portal vein embolization for primary and metastatic liver tumors: a systematic review and meta-analysis. *Abdom Radiol (NY)*. 2020;45:1297-1309.
8. Pawlik TM, Schulick RD, Curley SA. *Current concepts in the surgical management of colorectal liver metastases*. *J Gastrointest Surg*. 2019;23:1260-1270.
9. Hu M, Tang H, Wei Y. Robot-assisted hepatobiliary and pancreatic surgery: a systematic review and meta-analysis. *Surg Oncol*. 2021;36:7-17.
10. van der Wal RC, Kok H, de Jong KP. *Intraoperative imaging techniques in liver surgery*. *J Gastrointest Surg*. 2020;24:1896-1906.

Citation: Rahman F. Evolving liver surgery: Techniques, outcomes, and complexities. *aaasr*. 2025;09(04):226.