

**PRIORITIZING MINIMALLY INVASIVE ENDOVIDEOSURGICAL
APPROACHES IN THE SURGICAL MANAGEMENT OF COMPLICATED
HEPATIC ECHINOCOCCOSIS: A COMPARATIVE CLINICAL ANALYSIS**

Umarkulov Zabur Zafarjonovich

Samarkand State Medical University

Abstract

Despite increasing global attention to parasitic liver disease, the surgical community has yet to establish a universally accepted protocol for managing complicated hepatic echinococcosis — particularly one that systematically integrates minimally invasive modalities. This study investigates the clinical outcomes of 448 patients treated at Samarkand State Medical University between 2015 and 2024, examining whether a differentiated minimally invasive surgical strategy yields superior perioperative and long-term results compared to conventional open laparotomy. The findings demonstrate that adopting laparoscopic echinococcectomy, percutaneous puncture-drainage, and endoscopic transpapillary interventions as primary treatment modalities reduces postoperative complication rates from 24.1% to 8.1%, eliminates operative mortality, and lowers disease recurrence from 12.3% to 6.7%. These results confirm the clinical viability and superiority of minimally invasive surgical prioritization in both uncomplicated and complicated hepatic echinococcosis.

Keywords: hepatic echinococcosis, minimally invasive surgery, laparoscopic echinococcectomy, percutaneous puncture-drainage, cysto-biliary fistula, recurrence, albendazole, Clavien–Dindo classification

1. Introduction

Hepatic echinococcosis (HE) — caused by the larval stage of *Echinococcus granulosus* — remains a significant public health challenge in agricultural and livestock-rearing regions, including Central Asia, the Mediterranean basin, and parts of South America. In Uzbekistan, the disease carries endemic status, disproportionately affecting rural populations and frequently presenting in advanced or complicated forms due to delayed diagnosis. Complications including cyst suppuration, cysto-biliary fistula formation, mechanical obstructive jaundice, and intraperitoneal rupture substantially increase operative risk and demand more complex surgical strategies.

Traditional open surgical techniques — while widely practiced — are associated with elevated rates of postoperative complications, prolonged hospital stays, and non-

negligible recurrence. Over the past two decades, laparoscopic echinococcectomy, image-guided percutaneous puncture-aspiration-injection-reaspiration (PAIR), and endoscopic retrograde approaches have emerged as less traumatic alternatives. However, controversy persists regarding their applicability in complicated disease, particularly when suppuration, biliary communication, or endogenous intoxication complicate the clinical picture.

This thesis argues that a rigorously differentiated minimally invasive surgical strategy — based on objectively defined selection criteria adapted to cyst type, localization, and complication pattern — can achieve superior outcomes across virtually all clinical presentations of hepatic echinococcosis, including its most challenging complicated forms.

2. Materials and Methods

A total of 448 patients with confirmed hepatic echinococcosis and its complications were enrolled consecutively from the surgical and radiology departments of Samarkand State Medical University's multidisciplinary clinic during 2015–2024. Patients were allocated to two groups based on the surgical strategy employed. The primary (study) group comprised 236 patients managed using minimally invasive technologies, including laparoscopic echinococcectomy, laparoscopic ideal echinococcectomy, laparoscopic total and subtotal pericystectomy, percutaneous transhepatic puncture-drainage procedures, endoscopic transpapillary sphincterotomy (ESTS), and minilaparotomy-access open echinococcectomy. The control group comprised 212 patients treated by conventional open laparotomy.

Demographic characteristics revealed a female predominance (52.9%) with the majority of patients aged 18–40 years (62.5%). Rural residents constituted 67.2% of the cohort. Cysts were most frequently located in the right hepatic lobe (74.4%). Complications observed included cyst suppuration (28.5%), obstructive parasitic jaundice (22.9%), cysto-biliary rupture (21.6%), intraperitoneal rupture (2.1%), and recurrent echinococcosis (9.6%). WHO classification guided cyst staging: CL, CE1–CE5 subtypes were represented across both groups.

Preoperative workup included comprehensive ultrasonography, CT (33.1%), MRI (21.2%), and endoscopic retrograde cholangiopancreatography (ERCP) where biliary involvement was suspected. Intraoperative duplex scanning was employed in 35 cases to assess portal hemodynamics. Postoperative complications were graded using the Clavien–Dindo classification and biliary fistulae according to the ISGLS criteria. Long-term follow-up (1–5 years) was completed in 387 patients. Statistical

analysis was performed using the chi-square test and Fisher's exact test (significance threshold: $p < 0.05$).

3. Results

The study group underwent diverse minimally invasive procedures: open echinococcectomy via minilaparotomy (25.4%), laparoscopic echinococcectomy (15.6%), laparoscopic total pericystectomy (8.1%), laparoscopic subtotal pericystectomy (8.9%), laparoscopic ideal echinococcectomy (6.7%), percutaneous transhepatic puncture-drainage combined with laparoscopic echinococcectomy (2.9%) or with conventional open procedures (3.8%), standalone percutaneous drainage (5.1%), ESTS with nasobiliary drainage and subsequent open echinococcectomy (7.2%), videolaparoscopic choledochotomy with conventional echinococcectomy (1.3%), and conventional echinococcectomy with residual cavity video-endoscopy (14.8%). Minimally invasive approaches were feasible in 65.2% of all cases.

The overall postoperative complication rate was significantly lower in the study group: 8.1% versus 24.1% in controls ($p < 0.05$). Specific complications in the control group included wound suppuration (17.9%), bile leakage from the residual cavity (8.4%), residual cavity suppuration (6.6%), reactive pleuritis (6.1%), and intraabdominal hemorrhage (5.6%); ten patients (4.7%) required relaparotomy, and one patient (0.5%) died from postoperative peritonitis with multiorgan failure. By contrast, no fatalities occurred in the study group, and no reoperation was necessary for complication management.

Long-term follow-up confirmed recurrence rates of 6.7% in the study group versus 12.3% in controls ($p < 0.01$). Early recurrences (within 3 years) were interpreted as residual in origin, while late recurrences (beyond 5 years) reflected implantation, metastatic, or reinfection mechanisms. Notably, 31.5% of recurrences occurred among patients who had not completed postoperative albendazole chemotherapy, underscoring the role of pharmacological adjuvancy in durably preventing disease relapse.

4. Discussion

The present study provides robust evidence that systematic prioritization of minimally invasive techniques — guided by objectively defined selection criteria — yields measurable clinical benefits in both immediate and long-term outcomes for patients with hepatic echinococcosis. The three-fold reduction in postoperative

complication rates and the near-halving of recurrence figures challenge the historic dominance of open laparotomy as the default surgical strategy.

A key contribution of this work is the formalization of selection criteria for minimally invasive intervention, encompassing cyst type (CE/CE1/CE3 per WHO classification), location within hepatic segments II–VI, cyst diameter under 10 cm, and the absence of lesions in surgically inaccessible segments (I, VII, VIII). For complicated cases — particularly suppurated cysts or cysto-biliary fistulae — a two-stage strategy was validated: primary minimally invasive septic focus sanitation followed by definitive radical surgery after endotoxemia resolution. This staged approach prevented the morbidity historically associated with single-stage open intervention on infected tissue.

The findings align with and extend international literature: Dziri, Bedioui, and Brunetti et al. have previously reported advantages of laparoscopic and percutaneous approaches in uncomplicated cysts, yet evidence for complicated disease has remained limited. The present cohort, which includes substantial proportions of suppurated (28.5%), obstructive (22.9%), and recurrent (9.6%) cases, demonstrates that minimally invasive strategies retain their advantage even in high-complexity presentations. Furthermore, the integration of intraoperative video-endoscopy for residual cavity inspection — enabling real-time detection and electrocoagulation of cysto-biliary fistulae — represents a technical refinement that may explain the lower bile leakage rate observed in the study group.

5. Conclusion

This thesis demonstrates that a differentiated, minimally invasive surgical strategy for hepatic echinococcosis — calibrated to cyst morphology, anatomical location, and complication severity — significantly outperforms conventional open surgery across all key clinical endpoints. The 65.2% feasibility of minimally invasive approaches, combined with a postoperative complication reduction from 24.1% to 8.1%, elimination of operative mortality, and recurrence reduction from 12.3% to 6.7%, establishes this paradigm as the standard of care at institutions with adequate laparoscopic and interventional radiology capability. Combined with structured postoperative albendazole chemotherapy, these strategies constitute a comprehensive and evidence-based treatment framework for hepatic echinococcosis in endemic regions.