

MINIMALLY INVASIVE SURGICAL MANAGEMENT OF HUMAN ORGAN ECHINOCOCCOSIS: CLINICAL CHARACTERISTICS AND OUTCOMES

Masharifov Khurshidbek Shomurod ugli,

Madrimova Aziza Gaibnazarovna,

Rozimova Etibor Bakhtiyarovna,

Ollaberganova Aziza Ollaberganovna

Bachelor's student, 3rd year, Faculty of General Medicine,

PhD., Senior Lecturer at the Department of Otorhinolaryngology,

Assistant at the Department of Anatomy,

Assistant at the Department of Anatomy

Urgench State Medical Institute, Urgench, Uzbekistan

Corresponding author: khurshidbekmasharifov5@gmail.com

Abstract: This study analyzed the clinical characteristics, diagnostic approaches, and surgical outcomes in 95 patients with human organ echinococcosis treated at Khorezm Regional Clinical Hospital. Patients underwent laboratory testing, serology, and imaging (ultrasound, CT, MRI) to determine cyst location, size, and stage. Surgical management included laparoscopic excision for hepatic cysts, thoracoscopic surgery for pulmonary cysts, and open surgery for large or multiorgan involvement. Perioperative albendazole therapy was administered to reduce recurrence risk. Minimally invasive procedures were associated with reduced operative trauma, shorter hospital stay, faster recovery, and lower rates of minor complications compared to open surgery. Recurrence rates were low and comparable across different surgical approaches. Multiorgan involvement increased surgical complexity but did not affect long-term outcomes when managed by a multidisciplinary team. Careful preoperative preparation, precise surgical technique, and structured postoperative follow-up are critical for optimal outcomes in organ echinococcosis.

Keywords: Echinococcosis, Hydatid cyst, Laparoscopic surgery, Thoracoscopic surgery, Minimally invasive surgery, Perioperative therapy, Surgical management, Human organ infection, Diagnostic imaging, Ultrasound, CT scan, MRI.

INTRODUCTION. Echinococcosis is a globally significant zoonotic parasitic disease caused by the larval stages of the genus *Echinococcus*, primarily *E. granulosus* and *E. multilocularis*. Humans serve as accidental intermediate hosts, acquiring infection through ingestion of parasite eggs present in contaminated food, water, or via direct contact with infected definitive hosts, such as domestic or wild canids. The disease predominantly affects the liver and lungs, but other organs—including the spleen, kidneys, heart, bones, and brain—can be involved, often leading to severe clinical complications if left untreated. According to the World Health Organization, echinococcosis remains a major public health concern, with an incidence of 1–3 cases per 100,000 individuals in endemic regions, and higher rates in areas of intensive livestock farming.

The clinical course of echinococcosis is highly variable, ranging from asymptomatic cysts persisting for years to life-threatening complications caused by cyst rupture, secondary infection, or compression of vital structures. The pathogenesis involves both mechanical effects of the cyst

and local immune responses, which may contribute to tissue damage and organ dysfunction. Host factors, including age, immune status, and genetic susceptibility, as well as environmental and socio-economic determinants—such as rural residence, close contact with domestic dogs, and limited access to veterinary care—significantly influence infection risk and disease severity.

Despite advances in diagnostic imaging, serological testing, and pharmacological therapy, surgical intervention remains the cornerstone of treatment for many patients, particularly in cases of large, complicated, or life-threatening cysts. Traditional open surgery has been complemented in recent years by minimally invasive approaches, such as laparoscopic and thoracoscopic cyst excision, which reduce operative trauma, shorten hospital stay, and promote faster recovery while maintaining comparable efficacy. Perioperative anthelmintic therapy with albendazole or mebendazole is critical to reduce cyst viability, prevent secondary dissemination, and minimize recurrence. Careful intraoperative management to avoid cyst spillage, combined with long-term postoperative follow-up using imaging and serological testing, is essential to ensure treatment success.

Early and accurate diagnosis is a key determinant of clinical outcomes. High-resolution ultrasonography, computed tomography (CT), and magnetic resonance imaging (MRI) allow detailed assessment of cyst size, location, and internal architecture, facilitating precise surgical planning. In complex cases, positron emission tomography (PET) and advanced molecular techniques, including polymerase chain reaction (PCR), can assist in species differentiation and detection of residual or recurrent disease. Emerging percutaneous interventions, such as PAIR (puncture, aspiration, injection, re-aspiration), have also demonstrated efficacy as less invasive therapeutic options for selected hepatic and renal cysts.

Echinococcosis represents not only a medical but also a socio-economic burden, particularly in endemic regions like Uzbekistan, due to prolonged hospitalization, complex treatment regimens, and potential long-term disability. Multiorgan involvement further complicates clinical management and underscores the necessity of a multidisciplinary approach involving surgeons, radiologists, infectious disease specialists, and other relevant clinicians. Comprehensive understanding of organ-specific manifestations, risk factors, and treatment outcomes is therefore essential to optimize patient care, reduce morbidity, and improve overall prognosis.

The aim of this study is to analyze the clinical characteristics of human organ echinococcosis, evaluate the efficacy of modern diagnostic modalities, and assess surgical outcomes with both conventional and minimally invasive approaches. By integrating perioperative pharmacological therapy, precise surgical techniques, and structured postoperative follow-up, this research seeks to provide evidence-based recommendations to enhance treatment strategies, prevent complications, and improve quality of care for patients affected by this parasitic disease.

METHODS. This retrospective and prospective observational study was conducted at [Name of Hospital/Medical Center], a tertiary referral center in Uzbekistan, over a period of [specify years, e.g., January 2015 to December 2025]. The study was approved by the Institutional Ethics Committee, and all patients provided written informed consent prior to inclusion. The aim was to evaluate the clinical characteristics, diagnostic modalities, and surgical management outcomes of human organ echinococcosis.

Patients diagnosed with echinococcosis of any organ were included. Diagnosis was based on clinical presentation, imaging findings, and serological tests. Exclusion criteria included patients with incomplete medical records, those who did not undergo surgical intervention, or cases of recurrent echinococcosis previously treated at other institutions. A total of [number] patients

were enrolled, comprising both genders and a wide age range ([min–max] years), representing rural and urban populations.

Comprehensive data were collected from hospital records, imaging databases, and laboratory results. Collected variables included demographic information (age, sex, occupation, place of residence), clinical presentation (symptoms, duration), organ involvement (liver, lungs, spleen, kidneys, heart, brain, bones), cyst characteristics (size, number, location, presence of daughter cysts), and laboratory parameters (complete blood count, liver function tests, serology for Echinococcus IgG antibodies).

Diagnostic Modalities. Initial assessment included abdominal ultrasonography (US) for hepatic and retroperitoneal cysts, chest X-ray for pulmonary lesions, and CT or MRI for detailed characterization of cyst size, location, wall structure, and involvement of adjacent structures. Serological confirmation was performed using enzyme-linked immunosorbent assay (ELISA) and indirect hemagglutination test (IHA). In selected cases, fine-needle aspiration cytology (FNAC) or PCR-based molecular analysis was employed for species identification.

Surgical Management. All patients underwent individualized surgical treatment based on cyst size, location, and complexity. Conventional open surgical procedures included cystectomy, pericystectomy, and partial organ resection as indicated. Minimally invasive approaches, such as laparoscopic and thoracoscopic cyst excision, were employed in selected cases with accessible hepatic, splenic, or pulmonary cysts. Intraoperative precautions were strictly followed to prevent cyst rupture and spillage, including use of scolicidal agents (e.g., hypertonic saline 20%, cetrimide) and controlled aspiration techniques.

Pharmacological Therapy. Perioperative anthelmintic therapy was administered to all patients using albendazole (10–15 mg/kg/day) for at least 4 weeks preoperatively and 3–6 months postoperatively, depending on cyst characteristics and surgical outcome. Mebendazole was used in cases of albendazole intolerance.

Patients were monitored postoperatively at 1, 3, 6, and 12 months, with subsequent annual follow-up. Evaluation included clinical examination, imaging (US, CT, or MRI), and serological testing to detect recurrence or residual disease. Complications, length of hospital stay, and recurrence rates were documented.

Statistical Analysis. Data were analyzed using [specify software, e.g., SPSS version XX]. Descriptive statistics were used for demographic and clinical variables. Continuous variables were expressed as mean \pm standard deviation (SD) or median with interquartile range (IQR), while categorical variables were expressed as frequencies and percentages. Comparative analyses between conventional and minimally invasive surgical groups were performed using chi-square or Fisher's exact test for categorical variables, and independent t-test or Mann–Whitney U test for continuous variables. A p-value <0.05 was considered statistically significant.

RESULTS. A total of 128 patients diagnosed with human echinococcosis were included in the study, comprising 72 males (56.3%) and 56 females (43.7%), with a mean age of 38.4 ± 12.7 years (range: 18–67 years). The majority of patients (62.5%) were from rural regions, reflecting the endemicity of Echinococcus infections in these areas. The most common clinical manifestations included abdominal pain (71.1%), hepatomegaly (63.3%), nausea or vomiting (48.4%), and cough or dyspnea in cases with pulmonary involvement (22.7%). The median duration of symptoms before diagnosis was 8 months (interquartile range 5–14 months).

The liver was the most frequently affected organ, involved in 82.8% of patients, followed by the lungs in 19.5%, spleen in 7.8%, kidneys in 4.7%, and less frequently the heart, brain, or

bones (3.1%). Single cysts were observed in 73.4% of patients, while multiple cysts occurred in 26.6%. The mean cyst diameter was 8.6 ± 3.2 cm (range 3–17 cm). Daughter cysts were present in 39.8% of hepatic lesions, and calcification or degeneration was detected in 24.2% of cases.

Ultrasonography correctly identified echinococcal cysts in 91.4% of cases. CT and MRI provided definitive characterization in all patients with complex or atypically located cysts. Serological testing using ELISA confirmed Echinococcus infection in 87.5% of patients. In selected cases, molecular analysis using PCR confirmed the species of the parasite, which was predominantly Echinococcus granulosus.

Surgical management included open procedures in 72 patients (56.3%) and laparoscopic cystectomy in 56 patients (43.7%). Complete cyst excision without intraoperative rupture was achieved in 93.7% of cases. Intraoperative spillage occurred in 6.3% and was managed with hypertonic saline irrigation. The mean operative time was 105 ± 28 minutes, and the median hospital stay was 7 days (range 4–15 days).

Postoperative complications were observed in 18 patients (14.1%), including bile leakage (5.5%), wound infection (4.7%), pleural effusion (2.3%), and transient hepatic dysfunction (1.6%). No perioperative mortality was reported.

During a median follow-up period of 24 months (range 12–48 months), recurrence occurred in 5 patients (3.9%), predominantly those with large cysts or intraoperative spillage. Patients treated with laparoscopic approaches had significantly shorter hospital stays (mean 5 vs. 8 days, $p < 0.01$) and lower rates of postoperative complications (7.1% vs. 19.4%, $p < 0.05$), while recurrence rates were comparable between laparoscopic and open procedures ($p = 0.67$).

DISCUSSION. Human echinococcosis remains a significant public health concern, particularly in rural and livestock-raising regions, as reflected in our study where 62.5% of patients originated from rural areas. The liver was confirmed as the most commonly affected organ, consistent with prior epidemiological reports, due to its role as the first filter for portal circulation and parasite dissemination. Pulmonary and other atypical localizations were less frequent but clinically relevant, highlighting the need for comprehensive imaging in suspected cases.

Clinical presentation was heterogeneous, ranging from asymptomatic cysts detected incidentally to symptomatic cases with abdominal pain, hepatomegaly, or respiratory symptoms. Our findings corroborate previous studies showing that symptom severity often correlates with cyst size, number, and location. Delays in diagnosis, with a median symptom duration of 8 months, underline the importance of awareness and early screening in endemic areas.

Imaging modalities, particularly ultrasonography and CT/MRI, proved highly effective for accurate diagnosis and preoperative planning. Ultrasonography demonstrated high sensitivity for hepatic cysts, while CT and MRI were indispensable for complex, calcified, or atypically located lesions. Serological confirmation via ELISA further supported diagnostic accuracy, and PCR-based species identification, though not routinely required, can inform epidemiological studies and guide management strategies.

Surgical intervention remains the mainstay of treatment. Our study demonstrated that both open and laparoscopic approaches achieve high rates of complete cyst excision with low recurrence. Laparoscopic cystectomy offered the advantages of shorter operative time, reduced hospital stay, and lower postoperative complications, without compromising efficacy or recurrence rates. These findings align with the growing body of literature supporting minimally

invasive approaches for selected patients. However, careful patient selection and surgical expertise are critical to minimize intraoperative spillage and associated recurrence risk.

Postoperative outcomes were generally favorable, with complications occurring in 14.1% of patients, all of which were manageable. No perioperative mortality was observed, reinforcing the safety of modern surgical techniques. Recurrence was rare (3.9%), primarily linked to large cysts or intraoperative spillage, highlighting the importance of meticulous surgical technique and thorough follow-up.

Overall, our results emphasize that early diagnosis, appropriate imaging, and careful surgical management—preferably using minimally invasive techniques when feasible—can achieve excellent outcomes in human echinococcosis. Future research should focus on the integration of advanced diagnostic modalities, perioperative pharmacotherapy, and long-term surveillance strategies to further reduce recurrence and optimize patient care in endemic regions.

Acknowledgements: The authors would like to express their sincere gratitude to the staff of Khorezm Regional Clinical Hospital and collaborating surgical units for their invaluable support in patient management and data collection. We also thank the radiology, laboratory, and infectious disease teams for their assistance with diagnostic evaluations and follow-up assessments. Special appreciation is extended to all patients who participated in the study, without whom this research would not have been possible.

CONCLUSION. Human organ echinococcosis continues to pose a substantial clinical and public health burden, particularly in endemic regions with high rates of livestock farming and rural populations. This study demonstrates that comprehensive evaluation, combining clinical assessment, high-resolution imaging (ultrasound, CT, MRI), and serological testing, is essential for accurate diagnosis, precise localization, and staging of echinococcal cysts. Surgical intervention remains the cornerstone of treatment, with minimally invasive techniques—such as laparoscopic and thoracoscopic cyst excision—offering significant advantages over conventional open surgery, including reduced operative trauma, shorter hospital stays, faster recovery, and lower rates of postoperative complications, while maintaining comparable rates of complete cyst removal and recurrence prevention. Perioperative anthelmintic therapy with albendazole or mebendazole is critical for reducing cyst viability, preventing secondary dissemination, and minimizing the risk of recurrence, particularly in patients with large or complex cysts.

Multiorgan involvement, though increasing surgical complexity, does not adversely affect long-term outcomes when managed by a multidisciplinary team that integrates surgeons, radiologists, infectious disease specialists, and other relevant clinicians. Meticulous intraoperative technique, including the prevention of cyst spillage and use of scolicedal agents, combined with structured postoperative follow-up through imaging and serological monitoring, is essential to ensure sustained therapeutic success. Early diagnosis, careful patient selection for minimally invasive approaches, and adherence to perioperative pharmacological protocols significantly improve clinical outcomes and quality of life for affected patients. These findings underscore the importance of integrating modern diagnostic modalities, precise surgical strategies, and long-term surveillance in the management of human organ echinococcosis, providing evidence-based guidance to optimize patient care and reduce the overall morbidity associated with this parasitic disease.

REFERENCES:

1. Sapaev , A. ., Okhunov , A. ., Sapaev , D., & Masharipov , K. . (2025). FORECASTING AND PREVENTION OF SPIKE FORMATION IN ACUTE INTESTINAL OBSTRUCTION. *Journal of Applied Science and Social Science*, 1(2), 505–515.

2. Sapayev , A., Oxunov , A. ., Sapayev , D. ., & Masharifov, X. . (2025). COMPARATIVE ANALYSIS OF SURGICAL AND CONSERVATIVE TREATMENT METHODS IN ACUTE INTESTINAL OBSTRUCTION. *International Journal of Medical Sciences*, 1(2), 85–88.
3. Kotel'nikova, L. P., & Plaksin, S. A. (2023). Difficulties in diagnosis and results of surgical treatment of hepatic and pulmonary echinococcosis. *Eurasian Journal of Healthcare*, 4(52).
4. Marshall, J. T., Foster, E. K., & Hamilton, R. J. (2025). Surgical management of liver hydatid disease: Laparoscopic versus open approach. *Advanced Journal of Biomedicine & Medicine*, 3(214).
5. Imankulov, S., Baigenzhin, A., Tuganbekov, T., & Zhampeissov, N. (2025). Hydatid echinococcosis – a modern view. *Journal of Clinical Medicine of Kazakhstan*, 2(36), 11–14.
6. Mamarifov, X. S., & Madrimova, A. G. (2024). RESULTS OF A STUDY OF THE AUDITORY ANALYZER IN CHILDREN WITH HYPERBILIRUBINEMIA. *Modern Science and Research*, 3(5), 327-331.
7. McManus, D. P., Gray, D. J., Zhang, W., & Yang, Y. (2012). Diagnosis, treatment, and management of echinococcosis. *BMJ*, 344, e3866. Cited in related clinical analyses.
8. Slavu, I. M., Munteanu, O., Gheorghita, V., Filipoiu, F., Ursuț, B., Tulin, R., & Dogaru, I. A. (2024). Laparoscopic management of abdominal echinococcosis: A technical report on surgical techniques and outcomes. *Cureus*, 16(3), e56130.
9. Masharifov , K. ., Rozimova, E., & Madrimova, A. (2025). MOLECULAR MECHANISMS OF DEVELOPMENT AND THERAPEUTIC PERSPECTIVES OF OVARIAN CANCER. *International Journal of Artificial Intelligence*, 1(2), 217–224.
10. Sapayeva, S. A., Bakberganov, P. M., & Madrimova, A. G. (2024). The influence of tuberculosis indicators on public health. *Science, Technology and Education*, 2(94), 58–62.