International Journal of Research in Medical Sciences
Dissanayake SRA et al. Int J Res Med Sci. 2024 Jul;12(7):2294-2300
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012

DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20241874

Original Research Article

Experience in the treatment of liver echinococcosis in Grodno Region, Belarus

Senuri Randula Abeywickrama Dissanayake[1]*, K. A. Nethuki Akithma Kulasinghe[1], Mohamed Aslam Fathima Atheefa[1], Shyla Ruslan[2]

[1]Medical Student, Grodno State Medical University, Belarus
[2]Department of Surgical Diseases, Grodno State Medical University, Belarus

Received: 01 May 2024
Revised: 07 June 2024
Accepted: 20 June 2024

***Correspondence:**
Senuri Randula Abeywickrama Dissanayake,
E-mail: senudis@gmail.com

ABSTRACT

Background: A parasitic hydatid disease called liver echinococcosis is brought on by the tapeworm echinococcus and is a reason for concern for global health. In addition to the liver, the lungs can harbor parasites. In the life cycle of parasites, humans occupy a middle position. Depending on the size and intensity of the cyst, the clinical signs can vary and be non-specific. The complications include bleeding, perforation, suppuration, cyst rupture, mechanical jaundice, and portal hypertension. Here is an analysis of own results of surgical treatment of patients with liver echinococcosis in Grodno region, Belarus between June 2012 to October 2022.
Methods: The research design was cross-sectional. Diagnostic methods that are instrumental and laboratory-based include a general blood test, a biochemical blood test, an enzyme immunoassay (IFA), abdominal and retroperitoneal MRIs and ultrasounds, abdominal and chest CT scans and brain scans. There were 10 men and 17 women among the 27 patients. The age range of the majority of the patients was 18 to 83.
Results: All patients underwent resections, including laparoscopic procedures. One of the patients in our series of cases received a two-stage therapy regimen due to a secondary focus of echinococcosis in the left lung. In our series of cases, no postoperative complications or mortality occurred.
Conclusions: Patients with hepatic echinococcosis should be treated at specialized hospitals. Abdominal, chest, and brain CT scans are required in order to search for additional foci. When it comes to treating echinococcosis, minimal invasive surgical procedures should be preferred.

Keywords: Echinococcosis, Surgical treatment, Echinococcal cyst, Liver echinococcosis

INTRODUCTION

Echinococcosis is a severe liver disease caused by the larval phases of taeniid cestodes of the family Echinococcus. Six species have been perceived, yet four are of general wellbeing concern: *Echinococcus granulosus* (which causes cystic echinococcosis), *Echinococcus multilocularis* (which causes alveolar echinococcosis), and *Echinococcus vogeli* and *Echinococcus oligarthrus* (which cause polycystic echinococcosis). Two new species have as of late been recognized: *Echinococcus shiquicus* in little vertebrates from the Tibetan level and *Echinococcus felidis* in African lions; however, their zoonotic transmission potential is obscure.

A few examinations have shown that these illnesses are a rising general wellbeing concern and that they can be

viewed as arising or reappearing infections.[1] In many parts of the world where agriculture and stockbreeding are important sources of income, the disease continues to be a major general medical issue.[2] As per the biological life pattern of echinococcosis, herbivores serve as intermediary hosts, whereas carnivores are the definitive hosts.[2] Wolves, dogs, and other animals can spread echinococcosis.

It is extremely intriguing for wild creatures to be a wellspring of disease and canines are viewed as the primary wellspring of transmission.[3] Tapeworm, the causative agent of echinococcosis, is parasitic in carnivorous animals. Intermediate hosts like humans and agricultural animals are required for its entire developmental cycle. The transmission of echinococcosis from the definite host (canines and different carnivores) to the intermediate host (sheep, goats, pig and so forth) happens by the ingestion of embryonated eggs passed in the feces. The definite host is contaminated by the ingestion of cyst containing organs of the infected intermediate host (sheep, goats, pig, and so forth).[4] In the stomach of the host, under the action of hydrochloric acid, parasites are released from eggs (oncospheres). In turn, the released parasites penetrate through the mucous membrane of the small intestine and spread through the body by lymphogenic and hematogenic pathways (through the portal vein system).

Most parasites are fixed to the walls of the hepatic sinusoids, but some of the embryos pass through the hepatic bloodstream and enter the small circle of blood circulation, and then into the lungs. In the lungs and liver, the oncospheres form into a cyst delivering protoscolices and daughter cysts which fill the inside of the cyst. The distinct host will be infected on the off chance that they ingest organs containing cysts. When ingested, the protoscolices evaginate and attach to the intestinal mucosa. In 32 to 80 days after evagination the protoscolices form into an adult tapeworm.[4] In the beginning, the cyst is separated into an inner and outer layer with a double-walled structure. The inner layer is the intact parasite capsule membrane also known as the inner capsule. The outer layer is called the reactive layer of compressed host tissue also known as the external capsule. All echinococcus cysts are in danger of burst, which is delegated as a complication of cystic echinococcus and relies upon elements as age, synthetic response, bodyguard systems, the size and number of echinococcus blisters, and the site of event.[5]

After a month, single-chamber bubbles reach 1 mm in diameter. Depending on the rate of cyst growth and the malleability of the affected organ, the sizes of echinococcal blisters vary from 2-3 to 20-30 mm and can reach up to 15-20 cm in diameter. Aseptic inflammation develops around the cyst due to its compression of the surrounding organ tissue and, as a result, a fibrous capsule is formed, in which calcium salts are often deposited.

If the liver is involved, symptoms present when the cyst size is large (>10cm) in diameter or when 70% of the organ volume has been occupied by the cyst(s). Common presenting complaints are right hypochondrial pain, nausea, and vomiting.[6,7] Obstructive jaundice can occur if an adjacent liver cyst compresses the biliary system.[8] Physical examination findings may reveal hepatomegaly, abdominal distension.[9,10] Complications of hepatic hydatid cysts are usually not come but some, in, can be fatal if not detected early and if necessary, treatments were not done.[11] Out of the numerous complications of the cystic form of echinococcosis, rupture of hepatic hydatid cysts occurs in about 35% of cases, with communicating rupture being the most common type (15%), and then contained rupture (12%), finally, direct rupture (6%).[12]

Due to the asymptomatic course of the disease in the early period of its development, diagnosis is based on ultrasound, magnetic resonance imaging (MRI) and computed tomography (CT) data. The "gold standard" for the treatment of liver echinococcosis are surgical interventions, conditionally divided into conservative (closed or semi-closed echinococcectomy with partial excision of the fibrous capsule) and radical (typical or atypical liver resection, pericystectomy) approaches.[13] To this day, the issue of choosing an operation for echinococcosis remains debatable, depending on the size, prevalence, and localization of parasitic cysts.

METHODS

This cross-sectional study type was conducted by collecting data from 27 patients who underwent surgical treatment for liver echinococcosis between June 2012 to October 2022. There were 10 men and 17 women. Patients were evaluated, diagnosis, and continued care by the "Grodno University Clinic" of Grodno State Medical University Belarus at surgical pancreatology, hepatology and organ and tissue transplantation departments.

The inclusion criteria of this study primarily native Belarussians 18 to 83 from Grodno region. Seven patients were employed in the agricultural sector. All foreigners were excluded from this study.

For each patient, laboratory and instrumental diagnostic techniques were applied. Following tests are included; a general blood test, a biochemical blood test, an enzyme immunoassay (IFA) to detect echinococcus antigen antibodies, ultrasound and MRI of the abdomen and retroperitoneal area, CT of the abdomen and chest and a brain scan to search for further echinococcus foci.

Ultrasonography explains the internal structure, quantity, and location of cystic structures as well as the presence of issues especially in liver and lung disease. 14 It was found that the hydatid cysts were hypoechoic, double-configured forms on ultrasonography. A fibrous capsule made of fibrous tissue was used to symbolize the exterior

hyperechogenic layer. The chitinous shell was the internal layer of hyperechogenic tissue. From 40.6×36.4 mm to 160×105 mm, the size of the echinococcal cysts varied. In the void between the two shapes, the liquid of the hypoechoic layer was apparent. Also found inside the cyst were hyperechogenic inclusions, which are parts of the echinococcus germ.

The parasite cysts were shown to produce hyperintense and hypointense magnetic resonance imaging (MRI) echoes. Both the chitin shell and the fibrous capsule of the cyst exhibited a hypointense signal. The difference in their hypo intensity, meantime, brought attention to the cyst wall's double contour on the MRI scan. The dead maternal cyst was found in a linear hypointense region within the bladder lumen, recognized by a detached chitin shell.

The frontal, sagittal, and axial MRI projections are the three options for assessing internal organs. Because the fibrous capsule protrusions pierce the parenchyma of the surrounding liver tissue, they are referred to as the cyst's vulnerabilities (Figure 1).[15]

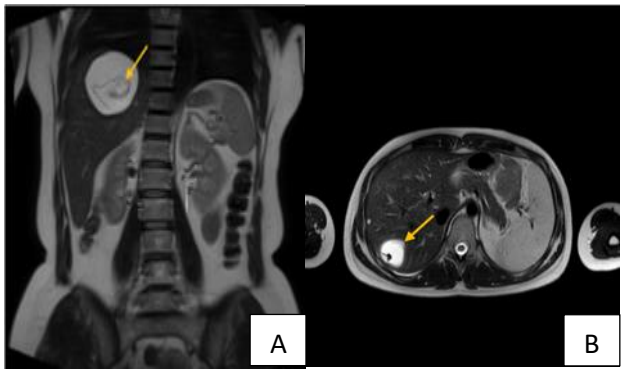

Figure 1 (A and B): Magnetic resonance imaging in the frontal and axial projection. Echinococcal cyst of the 7th segment of the liver. The arrow shows: 1-exfoliated chitinous membrane 2-bay of the fibrous capsule, protruding into the liver parenchyma in axial imaging.

Table 1: Blood sample analysis.

Blood test	Characteristics	Number of patier	Percentage
General blood test	Elevated ESR, Eosinophilia	7	25.9
Biochemical blood test	Elevated total blood plasma protein	9	33.3
ELISA	Antibody against echinococcus antigen	24	88.9

Contrast-enhanced computed tomography was used to assess the thickness, age based on daughter cyst calcifications, fibrous capsule integrity, and cyst invasion into the liver and arteries.[9] The patient had no parasite cysts in the brain, but a CT scan showed an echinococcus in the left lung. Blood test results are shown in Table 1.

Both qualitative and quantitative data were taken into account in the statistical analysis.

Permission was obtained from each patient identified in the research. The hospital's institutional ethics committee gave its approval to the study.

RESULTS

Among the 27 patients who participated in this study, there were ten men (37.03%) and seventeen women (62.96%). The ages of the patients were from eighteen to eighty-three. Out of the patients, seven were employed in the agricultural sector. All the demographic details are shown in Table 2.

Table 2: Demographic data of the study.

Characteristic	N
Participants	27
Mean age in years	52.5±5
Sex	
Female	17
Male	10

Table 3: Surgical procedures provided for the patients.

Surgical procedure	Number of patients
Transferred	3
Hemi hepatectomy on right side	2
Hemi hepatectomy on left side	3
Atypical liver resection	3
Open segmentectomy involving atypical liver resection	7
Laparoscopic segmentectomy	7
Liver resection utilizing the total vascular isolation and rebuilding of liver veins approach	2

The distribution of the different surgical methods used in the study will be shown in Table 3 and Figure 2.

Three individuals who had large liver cysts were referred to the "Minsk Scientific and Practical Centre for Surgery, Transplantation and Hematology" as a state institution for treatment. One patient's cyst was 160×105 mm, whereas the second patients measured 104×86 mm. The third patient had previously two liver procedures and transferred due to a recurrence of the disease.

The concomitant pathology that requires open surgical surgery in patients with a liver echinococcal cyst. A

laparotomy was performed to excise an echinococcal cyst from the fifth segment of the liver and resection of the middle hepatic vein and a cholecystectomy for cholelithiasis also intervened in one case. In another case, cholecystectomy, excision of the sigmoid colon, upper ampulla of the rectum, construction of a sigmorectal anastomosis for adenocarcinoma and resection of 4b and 5 segments of the liver with an echinococcal cyst were all performed during open surgery. Every case had a different trocar site for laparoscopic surgery. A single echinococcal cyst was the target of three trocars: one was meant for a laparoscope, and the other was meant for tools used for liver resection, wound care, and abdominal drainage. Considering where these formations were in the liver segments, further trocars were inserted for two or more parasite cysts.

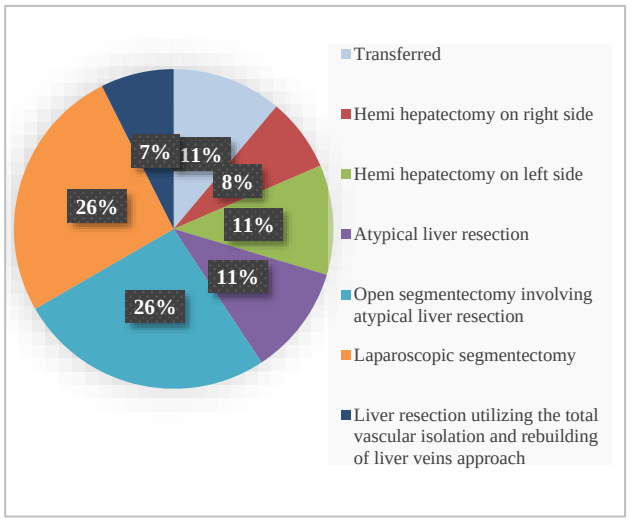

Figure 2: Surgical procedures provided for the patients.

After laparoscopic operation to remove parasite cysts from the liver's second and fourth segments, Figure 3 depicts the sewed wound. Surgical incision made through the abdomen's white line, the resected portion of the liver containing the echinococcal cyst was extracted from the abdominal cavity.

Figure 3: Photo of postoperative wounds after laparoscopic liver resection.

An ultrasonic scalpel, LigaSure equipment and a water jet dissector were employed during liver resection procedures. Patients were prepped for complete vascular isolation of the liver prior to surgery which helps reduce blood loss in situations where severe bleeding is possible. This technique consists mostly of separating and taking the lower hollow vein in its supra- and subhepatic parts on the turnstiles, as well as the hepatoduodenal ligament (Figure 4).

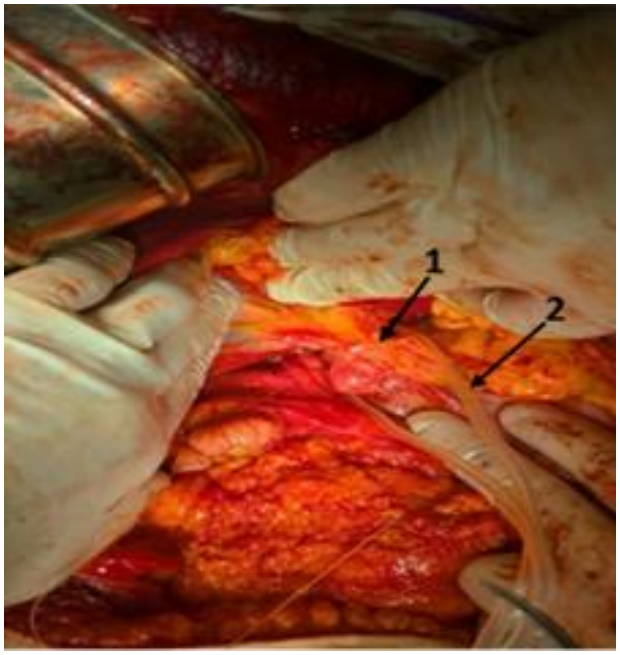

Figure 4: Operational photo, the stage of mobilization and taking on the tourniquet elements of the hepatoduodenal ligament. Arrow number 1 shows the hepatoduodenal ligament, arrow 2 – tourniquet.

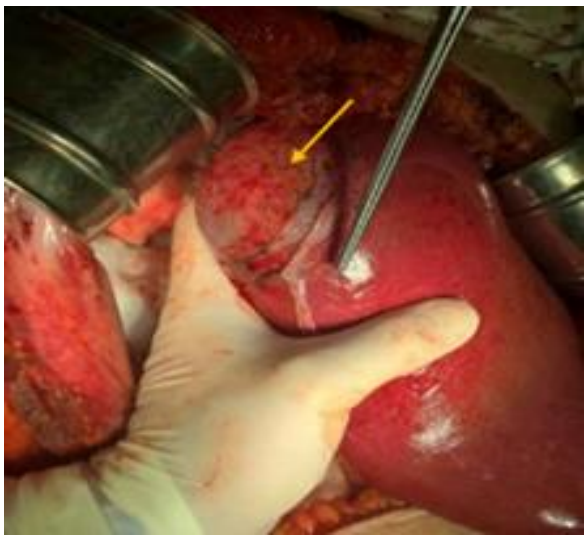

Figure 5: Operational photo, stage of liver mobilization and determination of resection boundaries. The arrow shows the echinococcal cyst, the tweezers show the resection border.

Figure 5 depicts an intraoperative photo of the resection of a hydatid cyst in the liver, the stage of hepatic mobilization and the delineation of the resection margins.

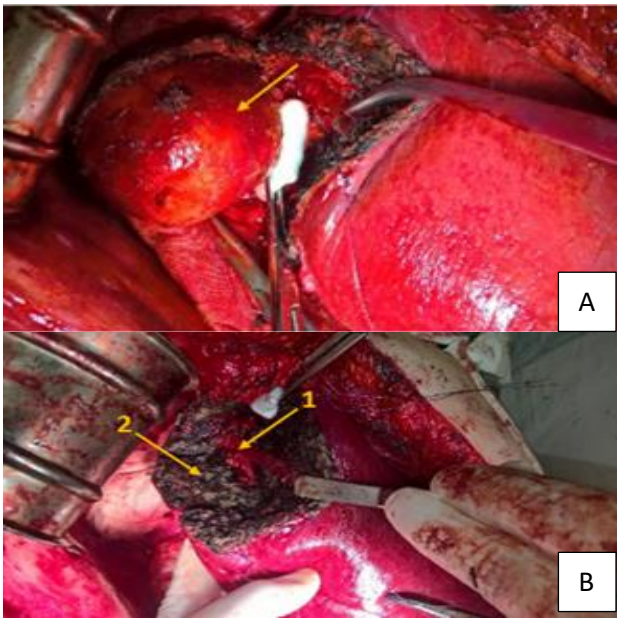

Figure 6 (A and B): Operational photo of the isolation of a parasitic cyst along with a fibrous capsule from the liver parenchyma and the residual cavity after removal of the cyst. Arrows show: 1 - right hepatic vein with tributaries from the segments; 2 - residual cavity after liver resection.

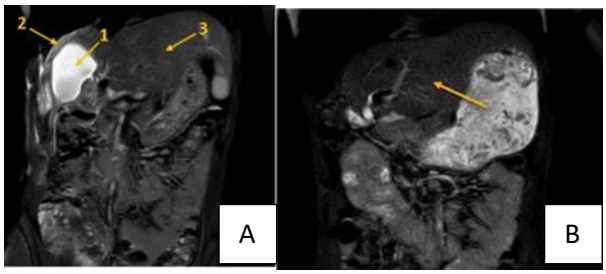

Figure 7 (A and B): Magnetic resonance imaging in the frontal projection. Echinococcal cyst of the right lobe of the liver before surgical treatment and structure of the liver after 5 years from surgical treatment. Arrows show: 1-cyst 2-hypotrophied right lobe of the liver 3- hypertrophied left lobe of the liver.

Figures 6 depict the parasitic liver cyst's isolation stage and the residual liver cavity's last view following the formation's removal.

In cases of right-sided hemi hepatectomy, echinococcal cysts occupied a significant part of the right lobe of the liver, which eventually led to hypertrophy of the left lobe, which was assigned the function of the organ after the removal of its right part. Figure 7 show magnetic resonance imaging of a patient with an echinococcal cyst of the right lobe before surgery and 5 years after surgery.

As can be seen on these tomograms, the hypertrophic left lobe of the liver after surgery is large enough to ensure the normal functioning of the organ. In the case of marginal echinococcal cysts, we gave preference to laparoscopic interventions, which reduced surgical trauma and contributed to the fastest recovery of patients.

There were no postoperative complications and mortality in our cases, all patients were discharged for outpatient treatment on days 12-18. In the postoperative period, hepatic failure was not recorded according to the laboratory and clinical examination of patients (increased transaminases, hepatocyte cytolysis and cholestasis syndromes).

After laparoscopic surgeries, the number of bed-days was 10±2, after open interventions -16±3, which in turn emphasizes the economic effect of using minimally invasive techniques. All patients were discharged in satisfactory condition for further treatment by surgeon at the place of residence, repeated visits, as well as recurrences of echinococcosis were not detected.

DISCUSSION

According to the long experience gained by treating the patients with hepatic echinococcosis suggests that a comprehensive physical examination along with obligatory brain and chest CT scans. Considering the cases shown above, one patient underwent a two-stage treatment regimen due to a secondary focus of echinococcosis in the left lung where, In the first stage, a video-assisted lung resection with a parasitic cyst was carried out in the Department of Thoracic Surgery; two months later, a laparoscopic atypical resection of the liver was performed. Surgical therapy was widespread, with significant prescription-only medication and mortality rates, the most prevalent causes being surgical site infection, organ failure, and sepsis. As a result, a prolonged hospital stay was documented.[16] Echinococcosis has a long latent course, which increases the likelihood of developing latent variants of the disease. A cyst development is frequently discovered accidentally during an ultrasound or X-ray survey. As a result, regular population diagnostics would increase the detection of early forms of echinococcosis in varied localizations.[17] Given that the development of the parasite causes IgM and IgG antibodies to emerge in the blood, immunological approaches play a crucial role in the diagnosis of echinococcosis.

It should be highlighted, nonetheless, that only 24 patients (88.9% of the tested patients) had antibodies to echinococcus antigens found in their blood by ELISA. The characteristic MRI picture of the disease and a histological evaluation of the excised macro specimen were used to confirm the diagnosis in three patients who

had a seronegative result. Our experience thus validates data reported in the literature, which states that 94-97% of cases can be diagnosed with echinococcosis using ELISA. Echinococcal cysts should be evaluated in the differential diagnosis of hepatic cysts, especially in patients at risk of exposure.[18]

PAIR (Puncture Aspiration Injection Respiration) is used when pain is severe or albendazole fails. In individuals with multivesicular cysts, PEVAC (Percutaneous Evacuation) is an alternative option. Percutaneous therapy with alcohol and polidocanol can be used instead of PAIR or PEVAC, but not for cystobiliary fistulas. Surgery is the first resort only when percutaneous therapy is unavailable or fails.[19] To date, the major surgical treatment options for Liver Echinococcosis are conventional and laparoscopic EE, as well as percutaneous puncture-draining therapies (PAIR and PEVAC methods). The goal of surgical treatment is to directly inactivate the parasite, evacuate the cyst while removing the germinal layer and pericystic zone, prevent the peritoneal spread of scolex, and treat RC, thereby resolving complications and the possibility of recurrence. However, according to research done, with all therapies, recurrence rates range from 7% to 25%, morbidity rates from 12% to 84%, and fatality rates from 0.5 to 6.5%.[19]

According to our study, traditional operations were performed in 74% (20 out of 27) and 26% (7out of 20) which correlates with the study done by Farkhod Radjabovich Yakubov, where traditional operations were performed in 80.1% (488 of 609) cases from the main group and Laparoscopic interventions in 12.3% (75 of 609).[17]

Even though there weren't any postoperative complications reported in our study; an original research article by Farkhod Radjabovich Yakubov shows that, among the main group of patients in the study, the overall complication rate was 8.0% (6 out of 69) after LapEE and 3.1% (15 out of 473) after conventional and resection EE.[17]

As a result, compared to patients undergoing surgical intervention for cystic hepatic echinococcosis, PAIR plus albendazole or mebendazole is associated with greater clinical and parasitological efficacy, less major and minor morbidity, lower rates of mortality and disease recurrence, and a shorter duration of hospitalization. As an initial treatment option or for patients who fail drug therapy alone, PAIR is a safe and effective procedure of choice for patients with hepatic echinococcosis.[20]

It was feasible to accomplish satisfactory hemostasis and expedite the surgical intervention time by utilizing an ultrasonic scalpel, a water-jet dissector, and the LigaSure device. It is stated that in order to reduce blood loss in the event of bleeding, the technique of total vascular isolation must be used during surgery. This, in turn, allowed for the implementation of a safer and more assertive approach to segmentectomy (S7) in two cases where the echinococcal cyst was in close proximity to the right hepatic vein.

Limitations

Although the study has reached its aims, there were unavoidable limitations. The sample size (27 patients) of this study is not large enough to generalize the results obtained by the study. Even though the study was carried out for almost 10 years (June 2012 to October 2022), the number of patients diagnosed with liver echinococcosis were considerably low. Therefore, in order to generalize the results for a larger group of patients, the study should have involved more participants.

CONCLUSION

Patients with echinococcosis, regardless of the size and location of the cysts, should be treated surgically in a specialized hospital of the regional or republican level, which has sufficient experience in performing liver resections. When choosing the method of surgery, preference should be given to minimally invasive technologies that are minimally traumatic and contribute to the early rehabilitation of patients, which reduces their stay in the hospital. Ultrasound and MRI should be considered the decisive diagnostic tests for echinococcosis, which make it possible to determine not only the presence of parasitic cysts, but also their size and shape, the nature of their contents and the thickness of the fibrous capsule, the shape of daughter cysts and the degree of their penetration into the capsule. This data should be used in planning the scope of surgery. Serological reactions to echinococcosis are mandatory, however, according to our data, their negative results do not exclude the presence of parasite cysts in the organs. Afterwards in the preoperative period, patients with echinococcosis of the liver are indicated to perform a CT scan of the chest and brain to search for possible other localizations of the parasite, as well as a CT scan of the abdominal cavity with contrast to clarify the relationship with the cyst of the hepatic vessels and ducts. Surgical intervention using the technique of total vascular isolation allows you to control blood loss during surgery and is preferable for resection of cysts with invasive growth into nearby large vessels.

ACKNOWLEDGEMENTS

The authors would like to express their gratitude to everyone who has supported and encouraged them while they have conducted their research.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Moro P, Schantz PM. Echinococcosis: a review. Int J Infect Dis. 2009;13(2):125-33.
2. Akbulut S. Hydatid cyst of the pancreas: Report of an undiagnosed case of pancreatic hydatid cyst and brief literature review. World J Gastrointest Surg. 2014;6(10):190.
3. Weng X, Mu Z, Wei X. The effects of dog management on Echinococcus spp. prevalence in villages on the eastern Tibetan Plateau, China. Parasit Vectors. 2020;13(1):207.
4. Rasheed K, Zargar S, Telwani A. Hydatid cyst of spleen: A diagnostic challenge. N Am J Med Sci. 2013;5(1):10.
5. Garg MK, Sharma M, Gulati A, et al. Imaging in pulmonary hydatid cysts. World J Radiol. 2016;8(6):581.
6. Fadel SA, Asmar K, Faraj W, Khalife M, Haddad M, El-Merhi F. Clinical review of liver hydatid disease and its unusual presentations in developing countries. Abdominal Radiol. 2019;44(4):1331-9.
7. Keong B, Wilkie B, Sutherland T, Fox A. Hepatic cystic echinococcosis in Australia: an update on diagnosis and management. ANZ J Surg. 2018;88(1-2):26-31.
8. Tsoulfas G, Hoballah JJ, Velmahos GC, Ho YH, eds. The Surgical Management of Parasitic Diseases. Springer International Publishing; 2020.
9. Wen H, Vuitton L, Tuxun T, et al. Echinococcosis: Advances in the 21st century. Clin Microbiol Rev. 2019;32(2):10-128.
10. El Nakeeb A, Salem A, El Sorogy M, Mahdy Y, Ellatif MA, Moneer A, et al. Cystobiliary communication in hepatic hydatid cyst: predictors and outcome. Turkish J Gastroenterol. 2017;28(2):125-30.
11. Wen H, Aji T, Shao YM. Diagnosis and management against the complications of human cystic echinococcosis. Front Med China. 2010;4(4):394-8.
12. Marti-Bonmati L, Serrano FM. Complications of hepatic hydatid cysts: Ultrasound, computed tomography, and magnetic resonance diagnosis. Gastrointest Radiol. 1990;15(1):119-25.
13. Julien C, Le Treut YP, Bourgouin S, Palen A, Hardwigsen J. Closed cyst resection for liver hydatid disease: a new standard. J Gastrointest Surg. 2021;25(2):436-46.
14. Filippou D, Tselepis D, Filippou G, Papadopoulos V. Advances in liver echinococcosis: diagnosis and treatment. Clin Gastroenterol Hepatol. 2007;5(2):152-9.
15. Radiation Diagnostics of Liver Echinococcosis.; 2021. Available at: http://www.centralasianstudies.org. Accessed on 20 February 2024.
16. Castillo S, Manterola C, Grande L, Rojas C. Infected hepatic echinococcosis. Clinical, therapeutic, and prognostic aspects. A systematic review. Ann Hepatol. 2021;22.
17. Babadjanov AK, Yakubov FR, Ruzmatov PY, Sapaev DS. Epidemiological aspects of echinococcosis of the liver and other organs in the Republic of Uzbekistan. Parasite Epidemiol Control. 2021;15.
18. Bhutani N, Kajal P. Hepatic echinococcosis: A review. Ann Medi Surg. 2018;36:99-105.
19. Schipper HG, Kager PA. Diagnosis and treatment of hepatic echinococcosis: An overview. Sca J Gastroenterol Suppl. 2004;39:50-5.
20. Smego RA, Sebanego P. Treatment options for hepatic cystic echinococcosis. Int J Infect Dis. 2005;9(2):69-76.

Cite this article as: Dissanayake SRA, Kulasinghe KANA, Atheefa MAF, Ruslan S. Experience in the treatment of liver echinococcosis in Grodno Region, Belarus. Int J Res Med Sci 2024;12:2294-300.