

 Khairullo Buranov,  Hamidulla Abdumadzhidov,  
 Otabek Eshonkhojaev,  Mirshavkat Akbarov,  
 Ludmila Nazyrova

Republican Specialized Scientific Center of Surgery Named After Academician V.Vahidov Tashkent, Uzbekistan

Received: 11 March, 2021

Accepted: 18 June, 2021

Published: 05 November, 2021

**Corresponding Author:** Hamidulla Abdumadzhidov,  
Republican Specialized Scientific Center of Surgery Named  
After Academician V.Vahidov Tashkent, Uzbekistan  
Email: hamidulla06@mail.ru

#### CITATION

Buranov K, Abdumadzhidov H, Eshonkhojaev O, Akbarov M, Nazyrova L. Surgical treatment of cardiopericardial echinococcosis. AZJCVS. 2021;1(2):55-9. DOI: 10.30546/azjcv. 2021.2.2.48

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## Surgical treatment of cardiopericardial echinococcosis

### Abstract

**Aim:** In the article there was reviewed results of diagnostic methods and surgical treatment 73 patients with echinococcosis of heart. The patients were divided on two groups depending on nature of involvement: the 1st group — it was isolated echinococcosis of heart/pericardium. The 2nd group — it was combined echinococcosis of heart and other organs (lungs or liver). Basic diagnostic techniques were echocardiography and MSCT. In 75% case the patients were operated in cardiopulmonary bypass; in 25% - without cardiopulmonary bypass. Postoperative mortality was 6.8%. Spontaneous perforation and anaphylactic shock were observed in 4.3% cases. Among not fatal complications there often were observed rhythm disturbances.

**Material and Methods:** 73 (100%) patients had an echinococcosis of the heart and underwent surgical treatment. Surgical intervention in 64.2% of cases was performed under cardiopulmonary bypass ( $75.0 \pm 7.6$  min) and cardioplegic arrest ( $45.3 \pm 4.9$  min) with median sternotomy.

**Results:** Total postoperative mortality in groups was 6.8% (5 patients). Non-fatal complications noted in 13 patients (17.8%). Heart failure was observed in 9 (12.3%) patients.

**Conclusion:** Echinococcosis of the heart is an intracardiac infection, the treatment of which is carried out according to all the rules of purulent-septic surgery.

**Keywords:** Cardiac echinococcosis, cardiopulmonary bypass, surgical treatment

## INTRODUCTION

Echinococcosis of the heart is rare, accounting for only up to 2.0% of all localizations of this zoonosis (1-6). A small number of studies on cardiac echinococcosis surgery attracts attention (1,5,7). Some publications and clinical observations on the diagnosis and surgical treatment indicate a lack of awareness of clinicians about the diagnostic features and methods of surgical treatment. However, in endemic areas, there is a fairly “high” frequency of patients with heart echinococcosis, who need surgical treatment.

The purpose of the study is to analyze and evaluate the results of clinical diagnosis and surgical treatment of patients with cardiac echinococcosis.

## MATERIAL AND METHODS

In GU “RSNPMTSH named Acad. V. Vahidov” for the period from 1994 to 2019, 73 (100%) patients had an echinococcosis of

the heart and underwent surgical treatment.

Patients were divided into two groups depending on the nature 1<sup>st</sup> group - 49 (67.1%) patients with isolated heart echinococcosis; 2<sup>nd</sup> group - 24 (32.8%) patients with combined echinococcosis of the heart / pericardium and target organs (liver, lungs, mediastinum) (Table 1).

The age of patients varied from 7 to 59 years old, averaged  $31.6 \pm 1.55$  years. Men were 36 (49.3%), women - 37 (50.6%). Diagnosis of parasitic damage to the heart was made by X-ray examination of the chest, transthoracic (TT) and transesophageal (TE) echocardiography (EchoCG), multislice spiral computed tomography (MSCT) and coronarography.

The absence of pathognomonic clinical symptoms, non-expression of clinical signs and laboratory changes and inconstancy of serological reactions dictates the need for the use of instrumental diagnostic methods.

**Table 1. The nature of the defeat of the organs of echinococcosis**

| Affected organs                       | 1 <sup>st</sup> group<br>n=49 (67.1%) | 2 <sup>nd</sup> group<br>n=24(32.8%) |
|---------------------------------------|---------------------------------------|--------------------------------------|
| Heart                                 | 46                                    | -                                    |
| Pericardium                           | 3                                     |                                      |
| Heart + liver                         |                                       | 6                                    |
| Heart + lungs                         | -                                     | 5                                    |
| Pericardium + lungs                   | -                                     | 9                                    |
| Multifocal damage of the chest organs | -                                     | 4                                    |
| Total                                 | 49                                    | 24                                   |

**Table 2. Topical localization of cysts in the heart**

| Location                | n=73 | %    |
|-------------------------|------|------|
| Left ventricle          | 45   | 61.6 |
| Pericardium             | 12   | 16.4 |
| Interventricular septum | 8    | 10.9 |
| Right ventricle         | 3    | 4.1  |
| Right atrium            | 2    | 2,7  |
| Aortic arch             | 3    | 4.1  |

MSCT makes it possible to identify very subtle structural changes without resorting to invasive studies (6). On computer tomograms, parasitic cysts are presented in the form of rounded formations with clear even contours. Calcification of the cyst greatly facilitates differentiation. Internal structures indicate the presence of daughter cysts. MSCT provides valuable information on the localization, size, and involvement of the tissue surrounding the Echinococcus cyst.

Surgical intervention in 64.2% of cases was performed under cardiopulmonary bypass (CPB) ( $75.0 \pm 7.6$  min) and cardioplegic arrest ( $45.3 \pm 4.9$  min) with median sternotomy. In cases of pericardial or combined echinococcosis of the pericardium and lung, interventions were performed with thoracotomy.

Operations under conditions of CPB included a standard protocol and antegrade crystalloid cold cardioplegia. After asystole, the parasitic area was lined with a gauze pad, puncture of the cyst cavity was performed in the most convex non-vascular part, then its contents were removed by external suction; then cystotomy and echinococectomy were performed. The residual cavity was treated with 30% sodium chloride solution or 80-100% glycerol solution. If possible, partial pericystectomy was performed. The area of cystotomy was sutured with a two-row etibond 2/0 suture - the first row with U-shaped seams on the gaskets, the second row - with a continuous blanket stitch. Cysts from the interventricular septum were removed from the right atrial access. At the same time, after puncture and aspiration of the cyst contents with an

“external” suction, the cyst cavity was opened, i.e. a cystotomy was performed, the cavity was treated with anti-scoliotic drugs and the cavity was left wide open, creating a common cavity with the pancreas cavity for permanent “irrigation” of the parasite's cavity with blood.

In 6 cases, echinococcosis of the heart was combined with parasitic liver damage and simultaneous intervention was performed, that is, one-step - sequential EE was first performed echinococectomy (EE) from the heart with CPB, and then - EE from the liver through upper median laparotomy access from the capitol of the cyst bed. In 2 patients a phased correction was performed, that is, first EE from the heart, and then, after normalization of the general status of the patient, after 2-3 weeks the second stage of the operation - EE from the liver. The postoperative period in patients with combined echinococcosis of the heart and liver proceeded relatively smoothly.

In 5 (8.9%) cases, combined heart and lung echinococcosis was observed. At the same time, at the beginning of activity, surgical correction was carried out in stages, in recent years, simultaneous treatment tactics have been successfully applied.

In 9 cases, we observed a combined lesion of the pericardium and lungs. In all cases, patients were successfully operated from the thoracotomic access without CPB, simulated EE was performed from the lung and pericardium with excision of the latter. Pericardial cysts in these observations were located extra pericardially. In one case, pneumonectomy was performed (due to multifocal recurrent lung lesions) with EE from the pericardium.

In 2 (3.5%) cases, multifocal lesion of the heart, pericardium, lungs and mediastinum occurred. Despite the prevalence of the process and taking into account the possible danger of perforation of the cyst and cardiac tamponade, patients were operated on for health reasons. The size of the cysts ranged from 3 to 8 cm. In the process of sternotomy, a clinical picture of anaphylactic shock, which was fatal, was observed. On autopsy, multifocality of parasitic lesions of the chest organs with perforation of cysts in the heart cavity was confirmed.

In the postoperative period, all patients underwent three courses of antihelminthic chemotherapy with mebendazole or albendazole (10-15 mg /kg/day) with monthly intercourse intervals under the control of blood tests (1,8).

## RESULTS

Total postoperative mortality in groups was 6.8% (5 patients). In the 1<sup>st</sup> group, 2 patients died in the early postoperative period. One of these patients was diagnosed with coronary angiography with a critical stenosis of the PILV. Simultaneous surgery was performed - EE from the left ventricle and coronary artery bypass surgery of the HMWH with CPB and CP arrest. The early postoperative period was complicated by bleeding. Performed resternotomy, debridement and stop bleeding. The patient died from multiple organ failure; in the second case, the patient died from bleeding due to a ruptured thinned left ventricular wall after

removal of an intramurally located cyst.

In the 2<sup>nd</sup> group, mortality was 5.3% (3 patients). When the echinococcal cyst of the interventricular septum was removed, damage to the anterior interventricular artery occurred, which led to the development of incurable cardiac weakness and was fatal.

In the postoperative period, antihelminthic therapy was carried out according to the recommendations.

Among non-fatal complications, ventricular arrhythmias most often occurred, which were noted in the 1st group in 7 patients (28%), and in the 2nd group - in 6 (19.3%). Heart failure in the 1st group was observed in 4 (16%), and in the 2<sup>nd</sup> group - in 5 (16.1%) patients. In 2 (8%) patients of the 1<sup>st</sup> group in the early postoperative period, a clinical picture of compressive exudative pericarditis was observed, which required drainage of the pericardial cavity. 2 patients (one in each group) had pulmonary complications. Complications from the organs of the abdominal and pleural bands were not identified.

Changes in the volume-functional parameters of the heart were not detected. Accumulation of fluid or suppuration of the residual cavity was not detected. In the dynamics, a decrease in the residual cavity was noted.

## DISCUSSION

Echinococcosis of the heart is a rarely encountered parasitic lesion, the frequency of occurrence of which, according to different authors, does not exceed 2% (1,3,7). It is more often observed in people of young age, mainly male (6,8,9). In our study group, the average age of patients is  $26.7 \pm 2.7$  years, which again indicates a high incidence rate among young people.

The clinical picture of the echinococcosis of the heart is non-specific, depends on the location and size of the cysts, as well as on the relationship with the adjacent cardiac structures (3,6). Thus, in the course of the study, we did not reveal specific symptoms characteristic of the echinococcosis of the heart, although at the location of the cysts in the ventricular septum a picture of atrioventricular block was observed.

In the world literature there is evidence that patients with heart echinococcosis are hospitalized in hospitals with a clinic impaired coronary blood flow (1,4,10). In our study, in 22.7% of cases in the preoperative period, myocardial ischemia was detected on an ECG, the signs of which disappeared after surgery. Only in one case was required coronary artery bypass surgery due to critical stenosis of the anterior interventricular artery. In the remaining cases, ischemia was caused by compression of the nearby coronary vessels with a tense parasitic cyst and was transient in nature.

In our patient cohort, the combination of echinococcosis of the heart and target organs was observed in 55.3% of cases; isolated heart echinococcosis in - 44.6%.

According to the literature, spontaneous perforation of the cyst into the pericardial cavity or into the heart cavity with the

development of anaphylactic shock is observed in 7–15% of cases (8). Some authors describe cases of perforation of cysts during cardiopulmonary resuscitation. In our study, 2 (3.5%) patients died due to a breakthrough of hydatid cysts in the heart cavity during the sternotomy stages, due to pressure on the sternum during the latter.

Echocardiography occupies a special place in the lifetime diagnosis of cardiac echinococcosis (4,10). We consider it expedient to carry out transesophageal EchoCG and MSCT for all patients, which allows not only to detect cystic heart formation, but also to detail the topographic graphic localization, the size of the cyst and the relationship with the coronary vessels (10). In the literature, the case of a multi-chamber echinococcosis of the heart, simulating a picture of a polycystic myxoma of the left atrium, is described. Only intraoperatively, the authors managed to establish a clinical diagnosis: cardiac echinococcosis (12). EchoCG also plays an important role in the postoperative monitoring of patients and for the timely diagnosis of disease recurrence (4,10).

According to the world literature, surgical treatment is the method of choice for echinococcosis of the heart (2,3,6,7,11).

When choosing surgical tactics, a number of authors prefer operations on a “beating” heart from thoracotomic access, especially in case of pericardial echinococcosis (8). Conducting an operation on a “beating” heart to remove an echinococcal cyst is associated with a number of complications, such as dissemination of the cyst contents, the possibility of accidentally taking nearby coronary vessels into the suture during the cardiac cycle, puss perforation during the processing of the parasite bed, the risk of aero-bolia and non-radical removal with a high risk of recurrence of the disease.

In the analysis of the literature, it is established that every sixth patient dies from bleeding during surgical treatment, especially if the latter is not performed in conditions of CPB. Therefore, some authors, fearing the occurrence of a number of complications (bleeding, myocardial rupture, etc.), consider it expedient to perform EE from the heart under the conditions of CPB and CP arrest (2,3,6,7,12). We also consider it expedient and justified to perform EE in the conditions of CPB and CP arrest.

Regarding the number of operations for the removal of hydatid cysts from the heart, it should be noted that the experience of a single team of authors does not exceed 2-3 observations. In this regard, only a few authors, such as Yu.L. Shevchenko. (2006), Bouraoui H. et al. (2005), Orhan G. et al (2008), Kabbani S.S. et al. (2007) have experience of echinococectomy from the heart in 5-19 patients. The doctor with the largest clinical experience is Thameur H. et al. (2001) from Tunisia, who described 45 patients with cardiac echinococcosis.

Unfortunately, there is no single point of view regarding the tactics of surgical treatment of combined echinococcosis of the heart and organs of targets. Thus, in many sources, the

phased removal of hydatid cysts is first reported from the target organ, after a short period of time - from the heart (Aliyev, MA et al. 1997). In contrast, Kabbani S.S. et al. (2007) in their 8 observations, the first stage of EE was performed from the heart, in 3-6 months from the liver or lungs.

The modern level of development of cardiac anesthesiology and cardiac surgery makes it possible to carry out simultaneous operations successfully. According to N. O. Travin (8), in echinococcosis of the pericardium and lungs, simultaneous operations are possible, because the cysts are located in the same anatomical cavity. The results of our research indicate that simultaneous surgery is possible, even if the parasitic cyst is located simultaneously in different anatomical cavities (thoracic and abdominal).

Localization, size and relationships of echinococcal cyst are of great importance for the selection of the optimal tactics of surgical treatment. In cysts of the interventricular septum, especially in the upper localization, there is a high risk of damage to the anterior descending artery with the development of coronary insufficiency or pathways with the development of complete atrioventricular blockade with Morgagni-Adams-Stokes attacks.

The problem of residual cavity after EE from the heart, especially with the so-called "big" cysts, still remains debatable. Some authors fill the cavity of the parasite with a piece of autopericardium or move a strand of the greater omentum from the abdominal cavity into the cavity of the cyst (1,7,8). With "large" intramural cysts of the left ventricle after EE, a large cavity with thin walls remains and the risk of rupture and development of the aneurysm is high. In such cases, we performed partial pericystectomy, given the variant anatomy of the coronary arteries. Pericystectomy - allows you to reduce the depth of the "residual" cavity. Further, the LV wall was sutured according to the Cooley method within the limits of healthy tissues with a two-row suture with a 2/0 etibond thread - the first row of U-shaped stitches on the pads, the second row - with a continuous obivnyum stitch.

Various antihelminthic agents are used to treat the residual cavity of the cyst. The most reliable and suitable for practical use turned out to be 30% sodium chloride solution and 80-100% glycerol solution (1,7,8). These drugs are destroyed by protoscolecox and acephalic cyst, which are responsible for the relapse of the disease and do not possess toxic properties.

Despite the fact that historians of medicine ascribe the first attempts at surgical treatment of parasitic cysts to Hippocrates, so far there is no unanimity of experts about the choice of the optimal strategy for the medical treatment of cardiac echinococcosis. There are reports of positive results from conservative treatment with albendazole. Other authors reduce the scope of chemotherapy without surgical treatment of the intervention only to patients with inoperable variants or who refuse surgery. Others perform an intervention on the heart after a course of chemotherapy, and also recommend, conduct therapy

and after surgery. Fourth consider treatment with albendazole prior to surgery as deadly and absolutely contraindicated due to the softening of the parasite wall during treatment and the multiplying danger of cyst rupture (1,7,12). Finally, the fifth notes the low efficacy of chemotherapy even after the removal of hydatid. We use chemotherapy only in the postoperative period to prevent recurrence of the disease.

Hospital mortality after surgical treatment is insufficiently covered in the literature, since most observations involve single operations. Thus, in 45 cases, according to Thameur H. et al. (2001) mortality was observed in 5.5%, recurrence of the disease - 4.4%; according to Elhattaoui M., et al. (2006) mortality was observed in 28% of cases; according to Jerbi S. et al (2008) - in 20% of cases. Orhan G. et al. (2008) notes mortality and relapse in 4% of cases. Our postoperative mortality was 6.8%.

In the postoperative period, non-fatal complications include pericarditis, pleural effusions and rhythm disturbances (17). In our study, rhythm disturbances were noted in 7 (28%) patients of the 1<sup>st</sup> and in 6 (19.3%) patients of the 2<sup>nd</sup> group. EchoCG before the postoperative periods showed no significant changes in the volume-functional parameters of the heart.

## CONCLUSION

Echinococcosis of the heart is an intracardiac infection, the treatment of which is carried out according to all the rules of purulent-septic surgery. These operations required the development of a new optimal surgical tactics, since an ideal echinococcectomy, which involves the complete removal of a cyst with a fibrous capsule, is unacceptable in cardiac surgery.

## FINDINGS

Transthoracic EchoCG is a screening method for the diagnosis of heart echinococcosis.

Patients with cardiac echinococcosis other than TT EchoCG, it is necessary to conduct TEE and MSCT to select the optimal tactics of surgical treatment.

In 55.3% of cases, a combination of echinococcosis of the heart and target organs was observed.

Echinococcectomy from the heart is advisable to perform in the conditions of cardiopulmonary bypass and cardioplegic arrest.

Topographic anatomic features (size, location and relationships with coronary vessels) of an echinococcal cyst are important in developing optimal surgical tactics.

**Competing interests:** The authors declare that they have no competing interest.

**Financial Disclosure:** There are no financial supports.

**Data Availability Statement:** The data that support the findings of this study are available from the corresponding author upon reasonable request.

**Study Association:** This study is not associated with any thesis or dissertation work.

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