



Review article

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ANESTHESIOLOGICAL TREATMENT OF PATIENTS WITH ECHINOCOCCAL HEPATIC CYST

SUMMARY

The incidence of hepatic echinococcosis is 10 patients per 100000 inhabitants. There are several things to point out: general state can be complicated with concomitant diseases when a variety of surgical procedures may be performed e.g. cyst extirpation or liver resection. It is very important to assess hydatid communication with big vessels, bile ducts and respiratory tract using imaging techniques. Hepatic echinococcosis can be associated with other cyst localization in the lung, kidney and brain. Specific complications are haemorrhage, anaphylactic reaction, pulmonary embolism, spontaneous rupture of hydatid cyst into inferior vena cava or bronchobilliar fistula into bronchial tree. Postoperative recovery can be complicated with the liver abscess, respiratory complications and coagulation disorders. Many problems associated with hepatic echinococcosis from anesthesiological point of view are presented in this paper.

Keywords: echinococcosis, hepatic, anesthesiological technique, surgical procedures

INTRODUCTION

The incidence of hepatic echinococcosis 4,75 to 12 patients per 100,000 inhabitants (1,2). Considering the frequency of this disease, the need for its surgical removal and some characteristics of the patients, it is anesthesiologist who plays an important role in the overall treatment. He takes part in preoperative preparation of the patient as well as in postoperative period.

PREOPERATIVE EXAMINATION

Preoperative preparation of the patient is a teamwork including interviewing a patient, physical examination, patient's history and follow-up documentations. Biochemical analysis, blood count, coagulation status, viral hepatitis exclusion, assessment of functional characteristics of the liver

tissues taken preoperatively (for example, lobar atrophy) and postoperatively, are very important. With the pressure it makes, an echinococcal hepatic cyst can cause lobar atrophy. If liver parenchyma has been already damaged (cirrhosis, inherited disease), the operation, including bigger resection, can seriously compromise its function.

The basic liver function tests are: bilirubin level, aminotransferase, alkaline phosphatase (alk. phos.), gammaglutamyltranspeptidase (GGT), albumin concentrations, INR (International Normalized Ratio for protrombin) and lidocain test (3).

By analysis of radiological results such as standard Chest X-ray, a CT scan, NMR of the chest and abdomen, ultrasound (US), we can assess the localization, number and size of echinococcal cysts, their distribution and their status in regard to great blood vessels, bile ducts and diaphragm. On the basis

of these diagnostic procedures, it is possible to predict the extent of the surgical intervention.

SURGICAL OPERATION

Surgical operation can vary from echinococcal cyst extirpation to liver resection. Approach can be laparoscopic or classic laparotomic one. In some cases, it is possible that surgical procedure spreads to other organs, for example to the adrenal gland or to the kidney. Cyst localization in comparison to major blood vessels (portal vein, inferior vena cava, hepatic veins and artery), major bile ducts and possibilities for diaphragm lesion and pleura is very important. According to these findings, the amount of blood and blood derivatives is carefully planned and the need for invasive monitoring is also considered. In case of communication between echinococcal hepatic cyst and interpleural space and/or airways, there is a need for double endotracheal tubes. Communication appears on the basis of "migration" by tissue destruction, infection, abscess and earlier surgical treatments of the lung or liver (4,5). If there are echinococcal hepatic and lung cysts at the same time, it is recommended to remove the lung cyst first. After recovery and when ventilatory and respiratory functions are satisfactory, hepatic cyst can be surgically removed. Echinococcal lung cyst grows faster and, by manipulation during the operation, rupture and content dissemination can easily occur. The cyst destroys lung parenchyma and leads to its restriction. Liver tissue is stronger and more compact than the lung tissue, so the cyst growth in liver tissue is slower (6). In some cases, it is possible to remove the liver and lung cysts at the same time (7).

For the liver surgical operation, enough blood for transfusion should be prepared. If great surgical operation with the liver parenchyma resection is to be done, intraoperative blood saving can be applied using "Cell saver". Filters can stop cancer cells and make passing of the parts of echinococcal cyst and their survival impossible (8). Acute normovolemic hemodilution and preoperative collection of autologous blood can be applied. Transfusiologist prepares plasma products with hemostatic activity (fibrin glue) which can be applied for stopping the bleeding from big resected areas.

PREOPERATIVE ASSESSMENT OF THE PATIENT

After interviewing a patient and recording patient's history, an anesthesiologist should evaluate the state of the patient in regard to his/her capacity to endure anesthetic and surgical treatment as well as postoperative recovery. These surgical treatments

are not usually urgent, so a patient can be preoperatively prepared.

Respiratory system evaluation is done by chest radiography and, depending on the associated diseases and planned surgical intervention, by testing lung function and by gas analysis of arterial blood. Depending on the findings, application of corticosteroids, aerosol medications, bronchodilators and physical therapy are administered. In case of pathological shades, bronchoscopy should be considered.

A long-term treatment of pneumonia has been described, but, it turned out to be a consequence of transfrenic migration of calcified hepatic cyst which ruptured into bronchial tree (9). Recurrent pleural effusion and asthmatic attacks, as a consequence of echinococcal hepatic cyst, can be possible (10). The signs of bronchiobiliary fistula are: chest pain, temperature, cough, expectoration, hemoptysis, biliary sputum, membrane parts expectoration and dyspnoea.

Cardiovascular condition evaluation is done by the basic tools such as history taking and electrocardiogram. Development of the chronic pulmonary heart disease is the consequence of movements of echinococcal cyst of the left lobe into inferior vena cava and of multiple pulmonary embolisms as well. The only treatment in such a case is chemotherapy. In some cases, there is such a dissemination that a patient can die due to the heart and respiratory failure (11).

Echinococcal cysts can be formed in one or both kidneys. When a great part of the liver tissue is damaged (atrophy) and the function fails, there is a risk of hepatorenal failure development. Thus, in such patients, optimal glomerular filtration, diuresis and electrolytic balance should be obtained and nephrotoxic and hepatotoxic medications should be avoided.

As for central nervous system, in case of developed hepatic failure, encephalopathy can occur. The presence of echinococcal cyst in the brain can be manifested as neurological seizures (epilepsy seizures, paresis, paralysis) (12). If there is a doubt of brain dissemination, CT and NMR of the head should be done.

Digestive system diseases are not necessarily associated with echinococcal hepatic cyst. H2 blockers are recommended. Due to the liver cirrhosis, oesophageal varices can be present and requires intensive postoperative monitoring.

All the patients should undergo analysis to assess coagulating status and they are: thrombocyte count, time of bleeding, prothrombin time (PT-a / INR-a) and partial prothrombin time (PTT-a). If there is a deviation from normal values or if there is liver failure, coagulation level should be determined.

If their concentrations in blood are decreased, INR increased, we can make it up with fresh frozen plasma (FFP), or using suitable medication with isolated factors together with vitamin K administration. If there is thrombocytopenia as a result of chemotherapy or hematological disease, it is obligatory to give thrombocyte transfusion preoperatively if the number of thrombocytes is low (less than $20 \times 10^9/l$) or if the patient has haemorrhage. In patients with jaundice, K vitamin is administered preoperatively.

Metabolic disorders (hypoproteinemia, hypoalbuminemia, hypoglycemia, hypermagnesemia, lactoacidosis) occur only in serious liver failure and must be treated preoperatively. Considering endocrine diseases, it is diabetes in most cases to be preoperatively regulated.

Pregnant women with echinococcal hepatic cyst are very rarely surgically treated, except in urgent cases (pain, ruptures, jaundice and infections) (13). The basic tasks of this anesthesia are avoiding teratogenic medications in the first three months of pregnancy, prevention of the intrauterine fetal asfuction and premature birth.

Besides medications taken for concomitant disease, some patients undergo echinococcal albendazole chemotherapy. Albendazole is a benzimidazole derivative with complete ovicidal, larvicidal and vermifugal activity. Its long-term high dose administration achieves higher drug concentration and its active metabolite in hydatoid liquid, decreasing thus scolex vitality. Albendazole side effects are: neutropenia, itching, skin redness, hepatotoxicity and very rarely thrombocytopenia (14).

ANESTHESIOLOGICAL APPROACHES DURING SURGICAL OPERATION

Premedication in patients in good overall condition is intramuscular or oral administration of benzodiazepine about 30 minutes prior to surgical operation. Preventively, antibiotic is administered intravenously using high dose. Most often, those are penicillin and cephalosporin of the first, second and third generation affecting staphylococcus and anaerobic bacteria which are potentially the most dangerous. The most important thing is to avoid antibiotics which are not safe for liver or some other insufficient organ (15).

Epidural catheter positioning or epidural anesthesia administration, if coagulating status allows, provide excellent postoperative analgesia as well.

Patient is introduced into general endotracheal anesthesia after electrocardiography, measuring of arterial blood pressure and after big lumen vein cannula positioning into peripheral vein

vessel. Conducting is done by means suitable to general condition and other concomitant diseases. Opiatic analgesics, non-depolarizing muscle relaxants as well as inhaled anesthetics are used for anesthesia. Halothane should not be used for its well-known hepatotoxicity. Total intravenous anesthesia can be administered by using propofol, intravenous anesthetic in continued infusion.

After introducing the patient into anesthesia, a single endotracheal tube is inserted, but in case of bronchobiliary fistula or hydatid lung cyst, double tubes are inserted. Nasogastric probe is placed as well as urinary catheter for diuresis monitoring.

In case a big surgical operation is expected, a central venous catheter (monitoring central venous pressure and providing a safe way to make up volume) and arterial line (gas analysis and invasive measuring of arterial pressure) are positioned. Pulse oximetry and capnography are necessary in laparoscopic interventions and if bronchobiliary fistula is present.

In pregnant women, after the 16th gestation week, constant monitoring of foetal heart, ultrasound cardiography and external tocodynamometry are recommended. Tocolitic solutions must be prepared (13).

Due to possible intraoperative bleeding, blood, FFP, fibrine glue, plasma expanders and inotropic drugs should be prepared. It is obligatory to follow blood loss, diuresis, hemodynamic parameters, hematocrit, hemoglobin and coagulating status.

Specific complications of surgical operation of echinococcal hepatic cyst are: haemorrhage, anaphylactic reaction, pulmonary embolism due to parts of the cyst and scolex dissemination, air embolia and echinococcal hepatic cyst rupture and its emptying through bronchobiliary fistula into breathing tree. In laparoscopic interventions, there is a greater risk of cyst rupture and poor control of content effusion, which can cause anaphylactic reaction and process dissemination (16). Possible intraoperative problems, like haemorrhage and bile ducts damage can cause conversion from the laparoscopic approach into laparotomy.

Sometimes, even the simplest surgical treatment can become a nightmare due to the vicinity of big blood vessels, characteristics of the liver tissue and coagulation disorder. Besides adequate intravascular volume made up by crystalloids, colloid, blood and blood derivatives application is recommended, with obligatory follow up of blood count, acid-base status and coagulation status. If needed, introduce inotropic support. Diuresis is a significant sign of adequate make up of circulatory volume, so it should be controlled and maintained. Anaphylactic reaction during operation is a serious

complication, but, fortunately, a very rare one (17,18). Since the patients have already been sensitized by echinococcal antigen, during the cyst manipulation, great amount of antigens come into blood stream and thus the anaphylactic reaction starts. Vascular collapse appears, followed by metabolic acidosis. After making a diagnosis, or after considering an allergic reaction, inhaled anesthetics are stopped being administered and 100% oxygen ventilation is introduced, volume is made up with crystalloids and colloids and adrenalin is administered. Laryngospasm and bronchospasm are possible. We recommend the patients to stay in intensive care unit at least 24 hours after operation.

Pulmonary embolism arises because of parts of the cyst and scolex dissemination into inferior vena cava and into right hepatic vein which are in vicinity of VIII liver segment. Rothlin showed a case of echinococcal cyst rupture into the aforementioned blood vessels during the manipulation in this segment (19). Massive pulmonary embolism by echinococcal material into paracentral branches of pulmonary artery appeared, and the result was lethal. In case of echinococcal cyst with this localization, total vascular exclusion is recommended before cyst drainage when extracorporeal bypass if necessary. Although it rarely occurs, venous embolism by carbon dioxide is the most dangerous and fatal complication of laparoscopic operation, which can occur at any time of laparoscopic operation. Early recognition and treatment of gas embolism reduce the size and consequences of gas embolism. It is manifested by subcutaneous emphysema, pneumothorax, pneumomediastinum followed by hypercarbia, hypoxemia, hypotension and cardiovascular collapse. The most precise diagnosis is made by Doppler ultrasound apparatus placed precordially or oesophageally, as well as by capnography and capnometry. Gas or foamy blood mass aspiration through the central vein catheter definitely confirms the diagnosis. Therapy involves breaking carbon dioxide inhalation, decrease of intra-abdominal pressure, pure oxygen ventilation, central vein catheter placement for gas drawing from the right heart, inotropic drugs administration and placing the patient on the left hip and into the Trendelberg's position.

While introducing anesthesia or intraoperatively, echinococcal cyst emptying can occur through bronchobiliar fistula into breathing tree. It is possible to start anesthesia and operation without any signs of bronchobiliar fistula. Due to this, precautions to decrease or eliminate consequences of its functioning (double lumen tubes) are not taken. During liver or cyst manipulation, cyst emptying through fistula into breathing tree can occur and the consequences are: infection, decrease of respiratory

and ventilatory lung characteristics, hypoxia, hypercarbia, atelectasis, process dissemination, pneumothorax and aspiration pneumonia. An anesthesiologist should apply 100% oxygen ventilation, foreign content aspiration through tubes, chest auscultation (because bronchospasm can easily appear) and control gas analysis of arterial blood. Breathing tree washing up can be discussed, because process dissemination can occur in bronchial tree.

POSTOPERATIVE TREATMENT

After surgically removed echinococcal hepatic cyst, patient spends the following 24 hours in intensive care unit if the interventions are not major ones. If there is doubt of intraoperative lesions of diaphragm and pleura, chest radiography is to be made. The basic postoperative therapy involves 2000-3000 ml of crystalloid and sweet solutions combination, antibiotics, H₂ blockers, antiemetic and analgesics. Depending on laboratory results, blood transfusion, blood products transfusion and FFP are given. Anticoagulant therapy is applied in patients with greater risk of thromboembolism. After big surgical operations where the great number of cysts have been removed, a part of liver resected, or if heavy bleeding occurred, a patient can spend more than one day in intensive care unit. Every day blood count, biochemical parameters (especially those to show liver function), PT and PTT are done. Studies on coagulation show abnormalities in massive transfusion regardless the resection size.²⁰ Slight increase of plasma bilirubin concentration happens in 70% patients in the postoperative period. Plasma transaminase concentration immediately after the operation has been increased in 90% of patients. In the next three or four days normal values are established again. Alkaline phosphatase level increases in the next two weeks (21).

Intestinal motility in these patients is quickly regained, so that after 24-48 hours, we start with oral administration.

Postoperatively, an abscess in the liver tissue is possible, as well as subphrenic abscess, pneumothorax, pneumonia, atelectasis development, bronchobiliar fistula, jaundice, liver failure and septicemia. Postoperative jaundice can be due to increased bilirubin, hepatocellular damage and extrahepatic obstruction. These complications require suitable treatment by surgeons, anesthesiologist and other medicine specialists.

CONCLUSION

A patient having echinococcal hepatic cyst can have this basic and some other concomitant diseases. The size of surgical operation influences

the choice of monitoring, blood and blood derivatives preparation. Anesthesiologist, surgeons and

transfusiologists teamwork is important for intraoperative and postoperative course.

REFERENCES

1. Obradović V. Uticaj preoperativne pripreme protoskolicida na vitalnost protoskoleksa u hirurgiji hidatidnih cista jetre. Magistarska teza. Beograd: Medicinski fakultet; 2001.
2. Obradović V. Tretman cistobilijarnih komunikacija u hirurgiji hidatidnih cista jetre. Rad uže specijalizacije. Beograd: Medicinski fakultet, 2002.
3. Liver Function Tests. In Felicity Hawker, eds. The Liver. New York; WB Saunders: 1993, 43-70.
4. Haraudou M, el Idrissi R, Alaziz S, Cherkaoui M, Halhal A. Spontaneous cutaneous cysto-hepatobronchial fistula caused by a hydatid cyst. Apropos a case. *J Chir -Paris* 1997; 134: 31-4.
5. Grande D, Ruiz C.J, Elizagaray E, Grande J, Barcena V, Eguidazu J. Hepatic echinococcosis complicated with transphrenic migration and bronchial fistula: CT demonstration. *Gastrointest Radiol* 1990;15: 115-8.
6. Blasco Navalporto MA, Corrales Rodriguez de Tembleque M, Poza Jimenez A, Sanchez Gomez Navarro J. Anaphylactic shock caused by spontaneous rupture of hepatic hydatid cyst into inferior vena cava. *Rev din Esp* 1993; 192: 49-50.
7. Dhaliwal RS, Kalkat MS. One-stage surgical procedure for bilateral lung and liver hydatid cysts. *Ann Thorac Surg* 1997; 64: 338-41.
8. Perseghin P, Vigano M, Rocco G, Della Pona C, Buscemi A, Rizzi A. Effectiveness of leukocyte filters in reducing tumor cell contamination after intraoperative blood salvage in lung cancer patients. *Vol Sang* 1997; 72: 221-4.
9. Del Rio Fernandez MC, De Frutos Arribas JF, Gonzalez Garcia J.L, Bellido Casado J, Marcos Martinez L, Fernandez Renedo A. Long - course pneumonia as manifestation of transphrenic migration of a calcified hydatid cyst. *An Med Interna* 1997; 14: 142-4.
10. Alba D, Diaz S, Gomez L, Villasanre C. Asthma as the first manifestation of hepatic hydatidosis. *Med Clin Bare* 1994; 102: 556-7.
11. Karnmoun S, Zayene M, Fendri S, et al. Chronic corpulmonale caused by hydatid embolism complicating hepatic hydatid cyst. *Ann Cardiol Angeiol-Paris* 1997; 46: 317-20.
12. Bensaid AH, Dietemann JL, De la Palavesa MM, Klinkert A, Kastler B, Gangi A. Intracranial alveolar echinococcosis: CT and MRI. *Neuroradiology* 1994; 36: 289-91.
13. Golaszewski T, Susani M, Golaszewski S, Sliutz G, Bichof G, Auer H. A large cyst of the liver in pregnancy. *Arch Gynecol Obstet* 1995; 256:43-7.
14. Vildiz BO, Haznedarolu IC, Coplu L. Albendazole - induced amegakaryocytic thrombocytopenic purpura (letter). *Ann Pharmacother* 1998; 32: 842.
15. Milićević M. Antibiotici u abdominalnoj hirurgiji. *Acta Chirug Jugoslav* 1995; 2 (suppl):7-46.
16. Marks J, Mouicl J, Kathouda N, Gudenheim J, Fabrani P. Laparoscopic Liver Surgery. A report on 28 patients. *Surg Endosc* 1998; 12:331-4.
17. Vaquerizo A, Solan JL, Bondia A, Opla JM, Madariaga MJ Intraoperative hydatid anaphylactic shock. *Rev Anesthesiol Reanim* 1994; 41:113-116.
18. Barović S., Ranković V., Palibrk L., Bašić M., Milićević M., Knežević S. et al. Intraoperativne anafilaktičke reakcije uzrokovane ehinokoknom cistom. Knjiga sažetaka. Kongres anesteziologa Jugoslavije, Cetinje, Jun 2002, 88.
19. Rothlin MA. Fatal intraoperative pulmonary embolism from a hepatic hydatid cyst. *Am J Gastroenterol* 1998; 93: 2606-7.
20. Felicity Hawker. Liver Trauma. In: Felicity Hawker, eds. The Liver. New York, WB Saunders: 1993, 357-71.
21. Palibrk I., Janković Z., Ranković V. i sar. Primena osnovnih laboratorijskih parametara posle resekcije jetre. *Anaesthesiol Jugosl* 1998; 23: 363-9.

ANESTEZIOLOŠKI TRETMAN BOLESNIKA SA EHINOKOKNOM CISTOM JETRE

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SAŽETAK

Ehinokokne ciste jetre javljaju se sa incidencom od 10 bolesnika na 100 000 stanovnika. Anesteziolog se susreće sa bolesnikom koji pored osnovnog oboljenja može imati i niz pratećih oboljenja koja zahtevaju preoperativnu pripremu. Obim hirurškog zahvata varira od ekstirpacije ehinokokne ciste do resekcije jetre, tako da i priprema za operaciju podrazumeva planiranje invazivnog monitoringa, pripremu krvi, derivata krvi i plazma ekspandera. Značajan je položaj ciste u odnosu na velike krvne sudove, bilijarne vodove i mogućnost komunikacije sa pleuralnim prostorom. Moguće su lokalizacije cista u plućima, bubrezima i mozgu. Specifične komplikacije su krvarenje, anafilaktička reakcija, plućna embolija, pražnjenje ehinokokne ciste kroz bronhobilijarne fistule u disajno stablo. Postoperativni oporavak je brz, ali može biti komplikovan pojavom apscesa u jetri, supfreničnog apscesa, respiratornim komplikacijama i poremećajem koagulacije.

Ključne reči: ehinokokus jetre, anesteziološke tehnike, hirurške procedure