

THE OPTIMAL MANAGEMENT OF HEPATIC HYDATID CYSTS. COMPARATIVE STUDY OF LAPAROSCOPIC AND OPEN SURGERY

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Received date: 17 March 2023

Revised date: 27 March 2023

Accepted date: 17 April 2023

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ABSTRACT

Objective: Echinococcosis is caused by parasite called *Echinococcus granulosus*. The disease is widespread in Syria Echinococcosis is cyclozoonosis caused by the larval stages (metacestode) of cestodes belonging to the genus *Echinococcus*. Humans are the intermediate host (dead end) and animals are both intermediate and definitive hosts. The most common site of occurrence of hydatid cyst in the humans, is the liver (from 50 to 70%). Surgery remains the mainstay of therapy. Whether open or laparoscopic surgery, should offer the lowest morbidity, mortality, and recurrence rates. **Methods:** Retrospective evaluation of 144 patients with liver hydatid cyst in the period between January 2021 and november 2022 in Damascus University Hospitals (AlAssad, AlMouassat). **Results & Discussion:** The mean operative time was 80 min and 50 min in open and laporascopy surgery. The mean hospital stay was 7 days in open surgery versus 3 days in laporascopic surgery. 10% patients were shifted from laparoscopic to open surgery. Persistent biliary fistula was seen in (16%) patients in open and one (11%) patient in laporascopic all patients in both groups needed endoscopic retrograde cholangiopancreatography with sphincterotomy for fistula closure. Using the omentum was the best for residual cavity. **Conclusion:** Both laparoscopic and open approaches are safe and effective. Overall laparoscopic management of liver hydatid cyst is cost effective in terms of early mobilization, early discharge and early resumption of work along with cosmetic benefit. The laparoscopic management offers a better alternative to conventional open surgery for the management of liver hydatid cysts and is worthy to be considered for suitable situations. Treatment with laparoscopy require preoperative perfect diagnosis and location of liver hydatid cyst. Intra operative bleeding and slightly more operative time can be overcome by experienced surgeon with expert team in laparoscopy.

SUMMARY

The aim of the research: to reach the optimal surgical treatment method for traumatic cysts in the liver.

Emphasis on the type of technology used and the management of the residual cavity, the types of explosives used, the mixtures, the methods of management and the length of stay in the hospital.

And the surgical treatment is the main treatment for the tragic cases.

And the appropriate treatment for the remaining cavity and the placement of the appropriate excretor, except for this by conventional or theoretical surgery according to the available possibilities and expertise.

Methods: retrospective cohort study - a comparative study including 144 patients diagnosed with cystic liver disease in the period between 1/2021 and 11/2022 at Damascus University.

Results: The percentage of females was more than 57% and the average age was 40 years and the right side was more affected than 70%. Regarding the surgical method: laparoscopic surgery, 36 patients with a hospital stay of 3 days and operation time of approximately 50 days, and 11% of bile ducts.

Conventional surgery 108 patients with a hospital stay of 7 days and operation time of approximately 80 min, bile discharge 16%.

The surgical technique using the method of decompression in the remaining cavity of the cyst was the least mixed" among other methods.

Also, endoscopic surgery reduces the length of stay in the hospital, reduces complications and enables the patient to return early to his daily activities.

Conclusion: Endoscopic surgery is a safe and effective method in the treatment of hydrohepatic cysts in carefully selected patients, with attention to good isolation of the cyst during surgical intervention or the use of modern techniques that are able to separate the cyst while minimizing infusion to the greatest extent, and the experience of the surgeon is a very important factor in this. Option of surgical procedure

Daughter cysts and the appropriate procedure

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The optimal management of hepatic hydatid cysts. Comparative study of laparoscopic and open surgery

1. The theoretical study

Background of the research and its importance.

Research objectives.

historical moment

Parasite study.

Hepatic cyst disease.

Symptoms and signs.
diagnosis.

Management

2. Practical Study

Research decision and methodology.

results.

Comparative study.

Conclusions.

Recommendations.

3. References

The theoretical study

Research plan

1. Research Background and Importance:

If the cause of the tragedy is parasite one of the legitimate causes is Echinococcus granulomas.

Hepatic Hydatid Cysts is endemic in the Middle East, the Middle East, and North Africa.

South America (1-2) and in these regions the surgeons are used to dealing with this disease and against the regions.

The West countrys, this disease is a surprise to the doctors, which makes them become adults in treating it.

The importance of this study comes from the fact that our country is considered one of the most affected areas. 1-2)

And cystitis is a parasitic disease that may be discovered by chance during a certain surgical procedure Or if the symptoms appear late, and which may lead to death if the fluid enters the abdominal cavity, such as There are different treatment methods according to the description of the case

It may be discovered suddenly. Some surgeon chooses laparoscopic surgery but the other prefer the classic open surgery and that according to the opportunity of the case, the experience of the surgeon and the previous radiological investigations

For surgery, a comparative study was conducted between the results of the two methods mentioned in the hospital of Damascus University to explain the results and complications of each method.

2. Research Objectives

The aim of this research is to provide insight into the methods of treatment and surgery Diseases of cystic fibrosis in the liver and the definition of the type of technology used and its management of Residual cavity and the types of explosives used and their combinations and methods of preparation and duration Staying in the hospital and having surgical treatment is the main treatment for tragic cases From the killing and dispersal of all the leaders and the cases of the children and the issuing of the appropriate measures for Residual cavity and that except by surgery of imitation or analogy.^[4-3]

3. Historical moment

It is a parasitic disease caused by a worm called al-Echinococcus granulomas and it is one of the legitimate diseases.

A well-known disease known as the first thousand-year-old liver disease Galenus in the first quarter of the year, the word "hydatid" was derived from the Greek, which means a drop of water.^[1-2]

4. Al-Tafili Study

The sex is mixed, and he is from the sect of the tapeworms of the people of the dead.

Suspicious species

Echinococcus granulomas (our study subject)

Echinococcus several holes.

Echinococcus several cysts.

And finally. E. Vogell.^[1-2]

Echinococcus lives in intestine of in a dog without a dog's fever, the length is less than 1 cm.

It takes 4-6 weeks to mature, life span 5-20 years.

The host

The end host: dogs, foxes, cats...

The med host The sheep, the goat, the goat, the pig, the horse, the camel, and the human.

Infection

Eating vegetables and food contaminated with worm eggs and direct contact with infected dogs or cats.

Geographical distribution

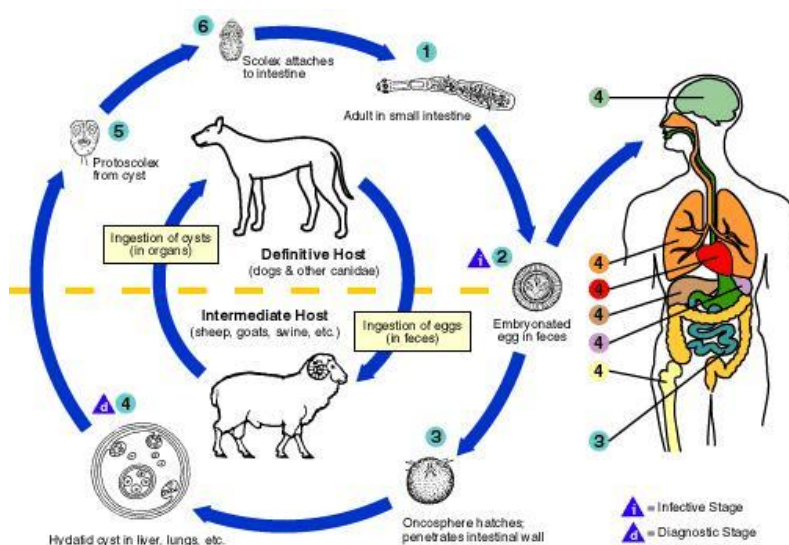
Middle East, North Africa, South America, Pacific.^[1-2]

Life Cycle: Form.^[1]

After the test, the egg reaches the intestine duodenum in the second half of the middle, the cover of the egg dissolves to release the fetus.

It passes through the mucous membrane of the intestine to the blood vessels of the al-Masari mesentery qiya and from it to the vein of the door and the fate of the period between

8 hours the time between eating eggs and be arrived to portal vein and the majority of the cases are concentrated in Right liver due to the abundance of its trivia is assumed to be with the left, since the dimeter of the branch of the Right portal branch is the greatest of all.



2. Life Cycle

Daughter cysts: It develops from germinal membrane in the form of sprouts and develops into cases of al-Jeel. The first one varies in diameter from several millimeters to several centimeters and is composed of germinal membrane germinal membrane may contains the stories of descendants.^[5-6]

Incident

It is based on the use of all the resources that can shorten the life of the child and includes

The end host: dogs, foxes, cats...and distance from the places of grazing and the places of slaughter.

Treated with Anti worms dan medicine

The med host: slaughtering sheep in legal slaughterhouses and disposing of waste well human: Health education and staying away from dogs and cats and avoiding children and washing vegetables Eating before death^[7]

5. Diseases

The liver is the most common place of injury (50-70%) and especially Right lobe liver, and if the fetuses are able to cross the liver, then it will be infected in different parts of the body, except for the painful cysts, such as the lungs) 30% of the muscles) (5-7% of the brain) (3-5% of

the spleen) (3-2% of the kidneys (2% of the bones) (0.5% of the cases and rarely heart failure.

6. Symptoms and signs

Due to the slow growth of the cyst, the non-diarrheal stage of the cyst is typical or prolonged Which plays a role in the occurrence of symptoms, the occasion and the size of the cyst.

An increase in the size of the cysts is the main cause of the symptoms.^[4-8]

These increases in size lead to the occurrence of abdominal pain, which is considered the most common and possible symptom

Liver mass, which is considered to be the typical ulcerative symptom of liver cysts.^[4-8]

As for when complications occur, the symptoms are severe.

Abdominal pain and trauma indicate the rupture of the sac to the abdomen.

Symptoms of inflammation of the bile ducts include jaundice, fever, and abdominal pain.

Biliary tract infection is the most common symptom 5-10%

Abdominal pain is accompanied by chest pain and cough.

Secondary bacterial infection is rare and gives abscess symptoms: fever, rales, abdominal pain.^[7]

7. Diagnosis of hydatid cysts

Paying attention to the diagnosis of tragic cases based on Clinical, laboratory and radiological findings.

- It is also very important to know the occupation of the patient and the area of residence.

Laboratory tests

Number of white blood cells and neutrophil

Elevation of acidity in the blood occurs in 30% of cases and rarely exceeds

The proportion of acidic urine is 10% of the total number of urine, and it is not very useful in diagnosis.

There is an increase in other parasitic diseases and allergic diseases such as rabies.^[9]

Liver function tests

Anxieties are non-specific and do not rely on diagnosis, and they occur in late cases

The disease or in the case of mixed cysts or multiple cysts associated with substances in the brain

Liver^[10]

Kazuni Test

It is a quick test, an orphan injection, and it is And it is not qualitative and is no longer used Except in epidemiological studies^[5]

Serum blood tests

Principle detection of specific antibodies to the cysts in the patient's blood.

Significance of serological test results

The smaller the size (the higher the position), the more evidence of a positive diagnosis.

The immune response of the body, to the adrenal cysts in the liver is stronger than the one in the lungs.

Therefore, the symptoms are clearer in the liver disease.

The percentage of false positives occurs if the cyst is dead or located in the lung.

A percentage of false positives occurs in cases of liver cirrhosis and erythema nodosum.

It is expected that the test results will decrease after the surgery, and the survival rate will be the same as the evidence

Complete removal of cysts.^[7]

Advanced Test

Indirect hemagglutination:

Enzyme-linked immunosorbent assay: ELISA

X-ray investigations

Echography Among the most comprehensive studies and the most used in the evaluation of the tragic cases.

Enjoy the feeling. 95-90%.

Showing the liquid content of the bag with the description of the anatomical features and the numbers and interests of the organs neighborhood.

He has written several works for the tragic stories based on the following:

GHABRI classification

Pattern: 1 plain bag.
Pattern: 2 bags with hydatid sand.
Type 3: The germinal membrane swims within the cavity of the cyst.
Type 4: The cyst is heterogeneous and echogenic.
Pattern 5: The wall of the cyst is calcified.

CT

It is considered the most accurate tool in the diagnosis of cystic fibrosis as it has a sensitivity of 95-100% (Figure 2).

It is better than Echo in Expression of mixed cysts such as jaundice and rupture of the bile duct.

Distinguishing the chronic cases from the complex cases such as discharges and hemorrhagic tumors.



Fig. (2): cyst on ct.

Cancer cells

Define the opportunity of the bag clearly and clearly.

Simple picture

Important in chest cysts, manifest only in chest cysts when present.

It is not useful in abdominal cases.

Magnetic resonance imaging (MRI).

More accurate than tomography in determining the relationship of the cyst with the vessels.

Liver scintigraphy:

The sensitivity is 90%, but it is rarely used in the treatment of cysts due to insufficient stratification.

Use of ERCP in management of liver cases

Preoperative: Patients who develop obstructive jaundice or inflammation of the bile ducts need

To the release sphincter biopsy

Post-surgery: Treatment of post-surgery complications, especially jaundice, bilious fistula, constipation

In modern age, the obstruction of the bile duct.

8 Treatment

Principles of management of the cysts

- Removal of bag with all contents
 - Protect the host from the spread of heads - Tactics and complications are not found.
- And all the options of surgery must be fulfilled except for surgical surgery

Imitation

There are other options such as drug treatment and Aspirate through the skin

Drug treatment

Treatment recommendations according to the recommendations of the World Health Organization:

- Inoperable cases.
- Patients who have multiple cases in one or more organs.
- Multiple peritoneal cysts
- Prevention of reflux when the cystic fluid leaks during the surgical procedure.
- Adverse conditions.
- In general, it is given before surgery for ten days and after surgery for three Months⁽¹¹⁾

Therapeutic compounds

Benzimidazole compounds are used for this purpose

1. Albendazole
2. Mebendazole

It is believed that the mechanism of the drug's effect is the depletion of oxygen in the sac.

The effectiveness of this drug is 30% of the total number of patients treated.

Albendazole

Perpetual action of albendazole at a dose of 10 mg/kg per day for a month.

by half One treatment and repeat the session several times according to the response.

- Absorption of the medicine is poorly digested.
- He is the best for the liver cases and the concentration in the mass is ten times

Almibendazole^[11]

Mebendazole: Almibendazole

Digestive absorption is weak, at least 10% of the wound

By oral route, it is given in a dose of 30mg/kg per day.

Showing side effects in a small number of patients, Intestinal irritation, itching, rash my skin
Urgency, disorders of liver functions are temporary and most of these effects appear during the month

The first of the treatment was reflection often at the end of the treatment.

When monitoring the patients who are on the treatment plan with medicines every week

Therefore, the normal number of liver diseases and liver diseases in the first three months.^[11]

Types of head-killing compounds

- Al-Formalin: It is not used for the treatment of urinary tract infections.
- Ethanol.
- Alyodic properties: its functionality is uncertain.
- Alaiter.
- Silver nitrate: 5%, it does not reach Al Duran but harms the bile ducts.^[12]
- Al-saline hypertensive: It is used in concentration (20-15% Most common to us).
- Citramid: 5% and it is considered as the most reliable agent.

Bile: where surgeons used to remove the gallbladder and then inject bile into it The bag to kill the heads..

Needle aspiration through the skin

This procedure involves several steps

1. Puncture the cyst through the skin.
2. Injection of lethal substances into the cavity of the sac.
3. Refresh the contents of the bag after about 10-15 minutes.

Repeat the process several times until the liquid is completely free, all these stages under control.^[12]

Recommendations

- It is used for skin application mainly for liver cysts and related complications Higher when using technology for other developments.
- Recently, the World Health Organization recommended this technique for non-surgically treatable conditions And for the patients who have surgery.
- Can be used for post-surgical complications.

Antibiotics

- Those who are sick and need to be treated.
- Cases of superficial inflammation of the liver and its impossibility of opening to the abdominal cavity.
- The calcified and inactive cysts.
- The cysts that are connected to the bile ducts.

Complications

Discharge of the contents of the sac into the abdominal cavity, bleeding, inflammation, swelling, inflammation of the intestines

inflammation

Chemical sclerosing cholelithiasis, biliary fistulae

Use medication for different periods before and after this procedure to reduce the risk of recurrence

These complications (probably 10 days before this procedure and duration of 8 weeks).

Mandatory as well as issuance of Mandatory as well as issuance of ERCP prior to this procedure

Treatment and also taking a picture of the cyst after the procedure to deny the existence of inter-cystic connection And the biliary tract.

Reduction of complications observed in this therapeutic method significantly and proportionately

Increasing experience of doctors

- The duration of recovery in this method is very short, even if it is caused by surgery.
- It is believed that this method is the best in the treatment of mixed hepatic cysts.

The developed country

Surgical treatment

Surgery is considered to be the best treatment for painful cysts where complete removal of the cyst is possible Healing of the disease and closeness of the lineage after surgery. 90%

Surgical Antibiotics

- General condition is bad.
- Patients in late life.
- Patients who have many minor or difficult cases.
- Bag diameter less than 4 cm.
- Patients who are infected with calcified liquid cysts

Options for surgery

- Removal of cystic fibrosis.
- Complete removal of cysts.
- Cut the liver.

Laporoscopic surgery

Pre-operative preparation

Give a single dose of antibiotic unmixed cases, but in case of mixing, it is given antibiotic was wide-ranging.

Administer 100 mg of hydrocortisone prophylactically in case of leakage (fear of panic), but some people don't do it.

Cystectomy

It is the most reliable surgical procedure and includes:

1. Open the cyst
2. Removal of the cyst fluid, girl cysts, heads, epithelial membrane germinated with the membrane plate attached to it.
3. Leave the layer around the bag and treat the remaining cavity in the same way as the surgeon.

Appropriate but using omentum or intimidation or drainage.

Surgical intervention when the superficial part of the cyst is allowed to be exposed in

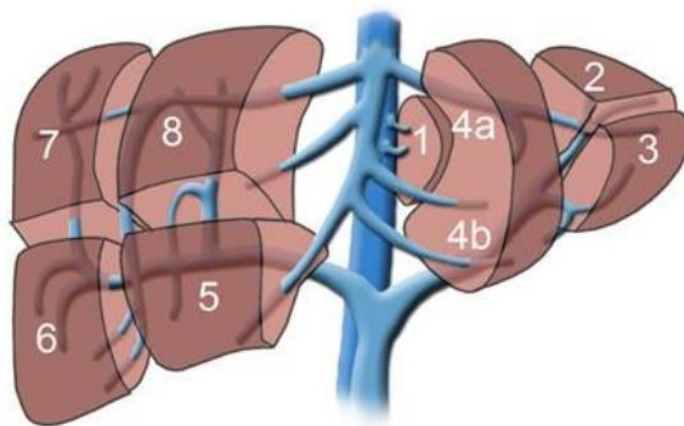
The central region of the wound

- When moving the liver, we get a better detection of the cyst.
- 20% saline-soaked skin placed around the sac to protect the abdominal cavity from liquid.

The cyst that leaks out during the manipulation of the cyst.

Before defeating the bag, when the rash was done by means of the needle, it was a big guess to reduce the pressure

The reduction of the chances of anarchy



(3) Liver section

1. Patients who have had previous abdominal surgery due to adhesions.
2. The difficulty of determining the connection of the sac with the bile ducts and the difficulty of managing it at present Its existence, extent and relationship between the cyst and the bile ducts according to studies ranging between (19 – 3.5%).
3. Who is the control over the infusion in the present situation is as difficult as open surgery

The secretion of the bladder is responsible for the regurgitation and reflux.

And therefore, when selecting the patients who come to the surgical operation for the tragic cysts.

The basic problems in surgical surgery for tragic cases are

1. Bile connection

The centrally located gallbladder is more prone to gallstones than the peripheral gallbladder.

And the connection of the bile forms the obstacle itself, except in front of the surgeons, the traditional or the analogical and but The disagreement is possible in the possibility of taking a pole and closing the connection in open surgery

Sufficient experience for the purpose of analysis (4)

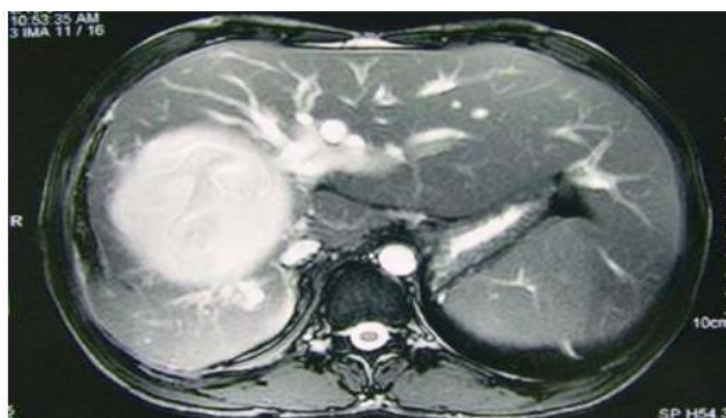


Figure (4): Connections of the bile duct with the cyst. 2 Infusion during surgery.

The power of conventional surgery lies in the control over the discharge of cystic fluid in the event of its occurrence

Faster and easier implementation of the theoretical surgery, since the latter depends greatly on surgeon experience.

And when the assimilation was done in fear of the shock of the piety and the duration of the failure

Later, there was a big debate among surgeons about the period of surgical surgery.

Therefore, most of the studies recommend anti-inflammatory drugs for the surgical oeration of cysts

Contraindications Of laporoscopic surgery

- Mouza al-Kisa al-Halfi) liver section 7, 1
- Previous surgery on the abdomen.
- Suspicion of connection with bile ducts.
- The frequency of al-kisat is more than . 3
- Deep-seated cysts within the hepatic brain.

The procedure begins with the injection of co2 gas into the abdomen using a ferris needle

Hanson's and Yatam's tunes followed by introduction of 3 tunes: the single for the camera, the final one for exile, and the third.

For dissection and determination of the location of the cyst after endoscopic entry, and if it is not possible to determine the location of the cyst, ICO is used.

An analogy to determine the location of cysts and orphans is to isolate cysts from adjacent areas with serum-soaked urine.

The cyst is isolated from its neighbors with gauze moistened with serum Concentrated saline The location of the cyst is determined, then emptied, and the highly concentrated saline serum is injected.

In the cavity and then removal of the mucous membrane along with its contents with washing the cavity.

It is possible to place the thread in the cavity of the bag and sew it or to make clips to fix it on the wall of the bag.

And it is also possible to put explosives inside the cavity of the sac or around the liver.

Then confirm the discharge in a heavy form and discharge of the altrucarar and emptying of the stomach from gases.

Other endoscopic procedures for anterior surface and non-calcified cysts include: A trocar is inserted over the site of the cyst, and through it a gauze moistened with

the lethal substance is inserted. For the parasite, the cyst is opened with a needle 14, and then the trocar is replaced with another larger trocar to retract the membrane. Bulging and lamellar, and then the endoscope is inserted into the cavity to investigate any remnants or biliary fistulas It is well washed with high tension serum 20%.

The results are similar to surgery in terms of risk and complications, except for the disintegration of the contents of the cyst and the infection

The danger

Therefore, all the theoretical methods that have been developed aim to avoid leakage of the contents of the bag due to lack of There is a possibility of placing symptoms around the liver

Practical study

1- Research design and methods

1- Design of the study

The research included all the reviewed cases of (Al-Assad and Al-Muoawassat) University Hospitals who were diagnosed with

Hepatic hydatid cysts- a retrospective cohort study

2 Place and time of study

Damascus University Hospitals (ALASSAD and ALMOUASSAT) in the period between 1/2021-11/2022

3 Groups of studies

The study included 144 patients diagnosed with hydatid cysts liver disease and their treatment and follow-up at Damascus University Hospital.

2-Results

We notice that the percentage of female injuries is greater than the percentage of male injuries, regardless of the geographical region and age, which is consistent with most local and international studies.

Note that the patients in ages (40-50), are the most affected 40 66% of patients had single cyst while 33% had multiple cysts 70% 36 patients underwent thoracic surgery while 108 underwent traditional open surgery For surgery, the duration of surgery was 50 minutes, with a hospital stay of 3 days, while open surgery was 80 minutes, compared to 7 days.

As for the complications, we note the non-existence of cross-examination or pleural effusion in the present case

ERCP and all cases of bile ducts are managed conservatively with the release of hypothermia

Where you operated on 16 patients, while the remaining 6 patients had less than 200 bile, you discharged them with explosives and follow-up.

You treat the rest of the cavity using drainage by 72%, and you make Omentum putting in the cyst cavity by 18%, and you do not use drainage at 10%.

You used tubular drainage and we did not use al-Zakzak

Residual cavity infection in 10 cases, 8 cases are prohibited to be treated with aspirate and 2 cases require surgical resection.

Comparative studies:-3

The accuracy is basically compared to the study

Octavian Fodor published in 2013 by Kanal deo, Rahul Kumar 2019, Ajaz AHMAD Srinagar India 2019

(14) Octavian Fodor (Zaharie et al) 1998-2008 Romania (Surg Endose 2013)
333 patients (59 laparoscopic surgery - 274 conventional surgery) Comparative study between open and laparoscopic surgery

Follow-up of the endoscopy group (6-32) months, the median was 24.2 months, and no recurrence was recorded

Follow-up of patients with open surgery (6-40) months, the average was 28.4 months, and no recurrence was recorded.

And the result of this surgical procedure was reliable and effective for all types of cysts with less morbidity

Kanal deo, Rahul Kumar 2019 India 2012-2019(15) 74 patients.. and the result of radical surgery was to reduce bile leakage and prevent reflux, which is better than conservative surgery.(16) Ajaz AHMAD 2014-2018 Medical College, Srinagar, India July 2019.

A comparative study of the use of an extradrainage or omentum in the management of residual space after resection of hepatic hydrocysts residual voiding after resection of hydrocystic cysts.50 patients.

The results were very close to the results of the international studies mentioned.

Lessons Learned

In these cases of tragedy, when there is doubt in the affected areas, the patient comes to the hospital.

Abdomen, especially in right hypochondrium or enlarged liver, and in spite of these known investigations.

Useful, but radiological investigations are preferred, especially those that do not give a diagnosis

Fast, non-invasive and cheap.

In general, most of the tragic cysts are single and uncomplicated and are placed in the safe sections of the liver and this.

It is in agreement with most of the references and studies on this disease.

The cyst may remain untreated for several years, and the patient will not be affected Complications, especially when there is a large volume, such as rupture of the sac or traumatic shock.

And paranchyme liver injury makes the diagnosis and treatment of this disease necessary.

Among these factors, the most important factor in the infection is the occupation and the geographical area, which is related to the spread of infection among the residents.

Rural people who come in contact with sheep and cattle, slaughterers and women, especially rural people.

The majority of people suffering from the disease are those who are productive in society.

Especially those who live between the third and fifth decades.

The areas of grazing and the spread of livestock that constitute the middle stage of the parasite, in addition to the presence of dogs in those areas, which form the final stage, and through contact with these animals, the infection and transmission of the disease between humans.

Surgical treatment is the most important treatment in the management of tragic cases despite them.

Drug therapy is used before and after surgery and in some cases, such as cystic fibrosis, but it remains

CONCLUSION

The use of imaging technologies can reduce the length of stay in the hospital and reduce pain in these cases. All of them were similar in that they were a single case.

And it is based on the safe and superficial and non-defective.

In spite of the functional role of these in the diagnosis, only in the axial class, the place is completely limited The bag is placed in a section (the number, size, location, and content) and thus it determines the best way.

For intervention and surgical intervention, as well as for the detection of other non-hepatic conditions, in addition to Its ability to explain the relationship of the cyst to the adjacent organs and vascular structures.

The main reason for the occurrence of reflux is leakage of the contents of the sac and non-protection of the liver and cavity.

Abdominal swelling, soaked with saline serum, hypertensive, in addition to the last cause of non-excision germinal membrane is completely distended, therefore, careful attention must be paid during surgery, especially during intervention most effective has the greatest effect in preventing the occurrence of annihilation.

The surgical technique followed by most surgeons is to drain and empty the sac after injecting the solution.

Normal saline hypertensive) who is considered to be employed as the accused in all operations

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