

The Relationship between Cyst Diameter and Long-Term Results of Pair Treatment

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Received: 28 July 2023

Accepted: 04 Sep 2023

Published: 11 Sep 2023

J Short Name: ACMCR

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Citation:

Yıldırım M, The Relationship between Cyst Diameter and Long-Term Results of Pair Treatment. *Ann Clin Med Case Rep.* 2023; V11(4): 1-5

Keywords:

Hydatid cyst, CE1, PAIR, Inactivation time

1. Abstract

1.1. Background/Aims: The PAIR (Puncture, Aspiration, Injection of scolicedal agent, and Reaspiration) treatment is used for echinococcosis type 1 (CE1) liver hydatid cysts. The aim of this study is to show the relationship between the cyst diameter and long-term results of PAIR.

1.2. Materials and Methods: Between 2016-2021, fifty patients with 54 liver CE1 hydatid cysts who underwent PAIR treatment were included in the study. Under general anesthesia, procedures were carried out. Technical success (completing the required steps in a procedure), clinical success (absence of recurrence or major complication upon follow-up), complications, cyst cavities' long-term alterations were evaluated. Inactivation times of cysts smaller than 6 cm and larger than 6 cm were compared.

1.3. Results: The long axis of the cysts was between 3 cm and 12 cm. Technical success rate was 100%. The average follow-up time was 996 ± 250 days. The cysts showed a mean volume reduction of 70.1% on follow up. The treatment was effective in 48 patients and 52 hydatid cysts. The effectiveness of the long-term treatment was 96%. Cysts smaller than 6 cm had a significantly shorter inactivation time than cysts larger than 6 cm ($p=0.01$). Recurrence (CE2) was detected in one patient (2 %). This patient was treated with the modified catheterization (MoCAT) technique. Major complication (abscess) was detected in one patients (2 %) and abscess was drained using the percutaneous seldinger technique. Intra-abdominal spread, anaphylaxis, or mortality did not develop in any patient. Post-procedural pain developed in 3 patients as a minor complication (6 %).

1.4. Conclusion: Although the inactivation time is longer in cysts larger than 6 cm, PAIR technique used to treat liver CE 1 hydatid cysts are effective and secure.

2. Introduction

Echinococcus Granulosus, which causes hepatic hydatid cysts, is a serious public health hazard for the general populace [1]. The disease is endemic in some Asian, Mediterranean, North and South African countries and Australia. The parasite most frequently affects the liver [2]. Patients has non-specific symptoms generally and hepatic hydatid cysts are detected incidentally. Rarely, cyst rupture to the biliary tract and peritoneum may occur and cause severe complications such as anaphylaxis. Even if viable cysts are asymptomatic, they should be treated because of possible life threatening complications [3].

According to the World Health Organization, cystic echinococcosis cysts are classified as active (CE 1, CE 2), transitional (CE 3a and CE 3b), and inactive (CE 4, CE 5) types by ultrasound image [4]. Treatment is advised for hepatic hydatid cysts CE1, CE2, and CE3 [5]. Surgery is the traditional method of treating hepatic CE. But surgery may be related to high rates of morbidity, mortality. The therapeutic efficacy of albendazole is limited in this patient group [6]. Percutaneous treatment for these patients has been demonstrated in modern clinical practice to be quite effective and to have decreased morbidity and mortality [7].

For the percutaneous treatment of hydatid cysts, there are three main methods. The most commonly used method is PAIR (Puncture, Aspiration, Injection of scolicedal agent, and Reaspiration). The other technique is the catheterization technique and is used for

CE1 and CE 3a cysts. The third method is the modified catheterization technique (MoCaT). MoCaT is used in percutaneous treatment of CE 2 and CE 3b hydatid cysts [8]. The cyst is punctured with one needle in PAIR technique. On the other hand, catheterization technique is need more needle and catheter manipulation. These techniques are widely used for treatment.

Generally, the PAIR technique is especially used for the treatment of CE1 cysts less than 6 cm in diameter [9]. Although the catheterization technique is used in larger cysts, PAIR treatment is also an alternative. A study on the relationship between cyst diameter and long-term results of PAIR therapy was not found in the literature. In this study, we aimed to evaluate the effectiveness of PAIR treatment, technical and clinical success rate, complications, and, relationship between the long-term results of PAIR and the cyst diameter for CE1 liver hydatid cysts.

3. Materials and Methods

The local ethics committee approved this study (Date: 25.05.2023, Protocol number: 2023/07-17). Informed consent was waived due to the retrospective nature of the study. Patients who underwent percutaneous treatment for hepatic hydatid cysts between 2016 and 2021 were examined. CE2 and CE3 cysts and patients who underwent the catheterization technique were not included in the study. Fifty patients (22 females) with 54 CE1 who underwent PAIR treatment were included in the study.

3.1. Pre-procedural Preparation

Ultrasonography was used to determine the hydatid cysts' initial diagnosis, and they were categorized according to ultrasound characteristics. Prophylactic albendazole was administered one week before the procedure orally at a dose of 10-15 mg/kg per day, and after the procedure, albendazole treatment was continued for four weeks [10]. Every procedure was carried out under general anesthesia due to potential severe allergic reaction risk.

For general anesthetic preparation, patients were fasted for at least 8-10 hours before the procedure. The patients' coagulation parameters were examined before the procedure and coagulation disorders were corrected before the procedure. Under US and fluoroscopic guidance, all procedures were carried out by interventional radiologist.

4. Technique

4.1. PAIR

Under sonographic guidance, an 18G Seldinger needle was used to puncture the cysts. About 20% of the cyst's estimated volume was aspirated. Under fluoroscopy, a contrast agent was injected via needle to detect any possible peritoneal or biliary connection. If cystography revealed there was no communication with the biliary tree, the remaining cyst was aspirated while keeping the needle tip inside the cyst. Then, hypertonic saline (30% in concentration) up to 30-35% of the initial cyst volume was injected. The cyst's

contents were re-aspirated through the needle when the membrane separated from the pericyst, which generally occurs approximately 7-10 minutes after the injection. The needle was withdrawn after re-aspiration and PAIR was terminated (Figure 1, 2, 3).



Figure 1: Puncture of cyst and aspiration of cyst content

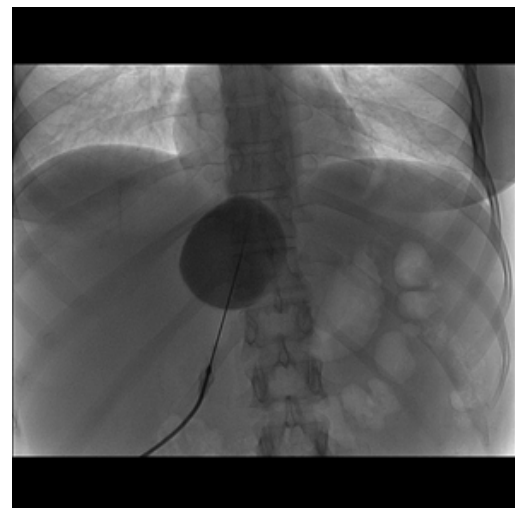


Figure 2: Cystography revealed there was no communication with the biliary tree



Figure 3: Injection of hypertonic saline

4.2. Follow-up

The first sonographic examination was performed in the first month after the procedure. In the first year, patients were followed up with by ultrasound every three months; in the second year, every six months; and in the years following that, every year. Our primary follow-up modality was ultrasound. In 6 cases, standard US follow-up was combined with the CT when the US investigations were deemed inadequate for the best assessment.

4.3. Definitions

Technical success was described as the successful completion of all catheterization and PAIR procedure steps. According to the CIRSE classification of complications, complications were categorized as major and minor [11]. Major complications (cavity infection, cysto-biliary fistula, and anaphylactic shock) and minor complications (fever, pain, temporary bleeding, and angioneurotic edema) were examined. Clinical success was described as the absence of recurrence or major complication upon follow-up.

The healing criteria included a decrease in cyst volume and size, thickening of the cyst wall and irregularities, a steady decrease in fluid content, and finally pseudotumor appearance. The period between the time of percutaneous procedure and the first follow-up when the cyst was transformed into an inactive form was referred to as the “inactivation time” (Figure 4). Inactivation times of all cysts were determined. On follow-up examinations, the appearance of double-layered wall sign or daughter vesicles was considered as recurrence. By the follow-up ultrasound reports, the follow-up time, last cyst volume at the follow-up, and inactivation time were noted.

Cyst volumes were determined using three orthogonal dimensions taken from two-dimensional ultrasound images ($A \times B \times C \times 0.523$). Age and gender of the patient, the number and size of cysts, the length of follow-up, recurrence rates, and complications and were all determined.



Figure 4: Cystic inactivation and pseudotumor appearance

4.4. Statistical Analysis

IBM SPSS for Windows, version 22.0, was used to conduct statistical analysis. Mann Whitney U test was used to compare inactivation times. A p value of <0.05 was considered statistically significant.

5. Results

The mean age of the patients was 41.35 ± 20.33 years. The long axis of the cysts ranged from 3 cm to 12 cm. The long axis of 30 cysts (55.5 %) was greater than 6 cm and the long axis of 24 cysts (44.4 %) was less than 6 cm.

Technical success rate was 100%. The average follow-up time was 996 ± 250 days. Pretreatment mean cyst volume was 195.5 (15-1656) ml and post-treatment final cyst volume was 58.6 (4-648) ml. The cysts showed a mean volume reduction of 70.1 % on follow up. 52 of the 54 cysts met the healing criteria on follow-up. Treatment was effective in 48 patients. The long-term success rate of treatment was 96%. The mean inactivation time of cysts smaller than 6 cm was 7.75 months. The mean inactivation time of cysts larger than 6 cm was 14.75 months. Cysts smaller than 6 cm had a significantly shorter inactivation time than cysts larger than 6 cm ($p=0.01$).

Cystobiliary fistula was not observed in any patient. Major complication (abscess) was detected in one patients (2 %). In this patient, abscess was detected 10 months after the procedure and the abscess was drained with the percutaneous Seldinger technique. Recurrence (CE2 hydatid cyst) was detected in the ninth month after the procedure in one patient (2%). Recurrence was treated with the modified catheterization (MoCAT) technique. Intra-abdominal spread, anaphylaxis, or mortality did not develop in any patient. Post-procedural pain developed in 3 patients as a minor complication (6 %). Other minor complications, such as fever, tachycardia, angioneurotic edema did not develop in any of the patients.

6. Discussion

This is a retrospective study showing the long-term results of PAIR treatment of CE1 liver hydatid cyst. Our study showed that long-term success rate was 96%. Cysts smaller than 6 cm had a significantly shorter inactivation time than cysts larger than 6 cm. Recurrence and cavity infection occurred in two patients. Abscess and recurrence was treated percutaneously. In our study, we did not experience any significant percutaneous approach-related problems, such as parasite seeding, anaphylactic shock, or patient mortality.

When compared to the outcomes of surgery and albendazole treatment, percutaneous treatment of hepatic CE1 (PAIR and catheterization procedures) was found to be very efficient and secure [12, 13]. Therefore, percutaneous treatment approaches have largely replaced surgery [14]. Percutaneous techniques is associated with lower morbidity and mortality, low recurrence rates and shorter hospital stays. Gupta et al showed that the rate of biliary fistula

and cavity abscess was significantly higher in the surgically treated group than in the PAIR-treated group [15]. Also, compared to a surgical technique, percutaneous approach is less invasive and more economical to treat numerous hepatic cysts, splenic hydatid cysts or other abdominal hydatid cysts [16-19].

In a study comparing PAIR and catheterization procedures, the rate of major complications was found to be 2.94% in the PAIR group and 36.84% in the catheterization group [20]. In the related study, percutaneous treatment was applied to CE1 and CE3a cysts, and the complication rate in catheterization group was higher than in PAIR group. Lower rates of complications and length of hospital stay are advantages of PAIR technique. In the presence of cystobiliary fistula, the catheterization technique should be used. In our study, PAIR treatment technique was applied only to patients with CE1. Long axis of the largest cyst was 12 cm. The long axis of 24 cysts was greater than 6 cm and the long axis of 4 cysts was greater than 10 cm. The PAIR technique is employed for the management of CE1 and CE3a cysts that measure less than 5 cm in diameter [9]. According to our study, PAIR treatment is effective and safe even for CE1 cysts larger than 6 cm. But in our study, cysts larger than 6 cm had a significantly longer inactivation time than cysts smaller than 6 cm ($p=0.01$). This finding may be seen as a disadvantage of the PAIR technique. Studies on this should be done.

Recurrence is still one of the most problematic aspects of managing hydatid disease [21]. The rate of recurrence following percutaneous treatment for hydatid cysts ranges from 0–4% [22]. In our study, recurrence rate was 2% and daughter vesicles were detected in the patient with relapse. This patient was treated successfully with MoCAT technique.

Our study includes a number of limitations. The relatively small number of patients and the retrospective nature are limitations of the study.

In conclusion, the primary line of treatment for CE1 cysts should be percutaneous methods. The long-term results of PAIR treatment for CE1 hepatic hydatid cysts are satisfactory. Although the inactivation time is longer in cysts larger than 6 cm, PAIR technique used to treat liver CE 1 hydatid cysts are effective and secure. Percutaneous treatment techniques have low complication rates and low recurrence rates. Percutaneous treatments such as MoCAT technique can be used for local recurrences.

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