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Outcome of Open Enucleation with Capitonnage for Hydatid Lung Disease in Children

Jamil Ur Rehman[1], Tahir Raza[1], Saddam Hussain[2], Hamdan Khan[1], Muhammad Abid Khan[1]

[1]Department of Cardiothoracic, Lady Reading Hospital, Peshawar, KP, Pakistan.
[2]Department of Paediatrics Surgery, Lady Reading Hospital, Peshawar, KP, Pakistan.

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Correspondence to: Jamil Ur Rehman, Department of Cardiothoracic, Lady Reading Hospital Peshawar, KP, Pakistan.
Email: jamilrehman1993@yahoo.com

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ABSTRACT

Introduction: Hydatid cystic disease remains an endemic surgical problem in many part of world including Indian subcontinent. Most commonly involved organs are the liver (60%-80%) and the lung (10%-40%) but it can involve any part of body. Surgery is preferable treatment of pulmonary hydatid among various surgical procedure open enucleation with capitonnage is preferred procedure. **Objectives:** To determine outcome of open enucleation with capitonnage for hydatid lung disease in children in term of postoperative complications and length hospital stay. **Materials and Methods:** This descriptive study was conducted at Thoracic Surgery Ward of Lady Reading Hospital (LRH), Peshawar between September 2023 and February 2024. A total of 118 patients were included in the study fulfilling the inclusive criteria. **Results:** Open enucleation with cappitonage were performed in 118 patients with pulmonary hydatid disease. The 57.4% were male and 42.6% female, and their mean age was 10.4 ± 3.2 years. 24.6% patients developed complication after surgery. Surgical site infection was the most frequent complication, reported in 6.8% of cases, followed by atelectasis (5.1%) and pneumothorax and surgical emphysema were observed in 4.2% of the patients, prolonged air leak 3.4% and 2.5% of patients developed empyema and residual cavity. Surprisingly, no mortality was reported among the patients who underwent surgery in this study. **Conclusion:** Thus, open enucleation with capitonnage is still considered safe and effective in paediatric hydatid disease with tolerable complications and good postoperative recovery.

INTRODUCTION

Hydatid cystic disease has been known since Hippocrates. Hydatid cystic disease remains an endemic surgical problem in many part of world where sheep and cattle raising is carried out including Indian subcontinent.(1),(2) More than one million people are thought to be affected with echinococcosis at any given time. For cystic echinochocosis there is an average of 2.2% post-operative death rate for surgical patient and 6.5% cases relapse after intervention.(3) It is caused by the larval stage (metacestode) of the parasite echinococcus (E) tapeworm which is a cestode of the Taeniidae family.(4) Four species of this worm are known, human disease is mainly caused by E. granulosus. This species causes cystic hydatid cyst. E. multilocularis, causes alveolar echinococcosis. E. vogeli and E. oligarthrus are rare species.(5)

The parasite involves dogs (the definitive host) and sheep (intermediate host). Man is an occasional intermediate host. Ingesting embryonated eggs through hands, food, drinks or materials contaminated with parasite eggs infects humans; the larvae reach the blood and lymphatic circulation and reach the liver, lungs and other organs. Cystic hydatid disease may develop in almost any part of the body, although the most commonly involved organs are the liver (60%-80%) and the lung (10%-40%).Most individuals who contract this parasite are young, and the majority of patients are less than 40 years of age, Children are more likely to develop pulmonary rather than hepatic echinococcus cysts. Pulmonary sites are the most common site of Intrathoracic hydatid cyst development; therefore, they are called pulmonary hydatid cysts. Conversely, cysts in diaphragm, pleura, mediastinum, pericardium, myocardium, fissures, and chest wall are called intrathoracic extra pulmonary cysts.(6-9)

Open enunciation with captonnage is preferable treatment of pulmonary hydatid which involves removal of cyst, obliterating the space and closing of small bronchial communications among various surgical techniques like enucleation, pericystectomy, cystostomy with closure of bronchial openings and capitonnage, cystostomy with closure of bronchial opening only, wedge resection, segmentectomy, lobectomy.(7, 8). In a study by Kisa A, et al 31% patients who had capitonnage developed

different complications. 13.2% had pneumothorax and emphysema, 3.9% residual cavity, 7.9% prolonged air leak, 15.4% atelectasis, 1% infection, 0% recurrence.(10) Open enucleation with capitonnage is frequently performed procedure for hydatid lung disease in children.(11) However, the procedure is not without complications. The purpose of this research is to evaluate the efficacy and safety of open enucleation with capitonnage in the management of hydatid lung disease in children.

Objective

To determine outcome of open enucleation with capitonnage for hydatid lung disease in children in term of postoperative complications and length hospital stay.

MATERIAL AND METHODS

This descriptive study was conducted at the Thoracic Surgery Ward of Lady Reading Hospital (LRH), Peshawar between September 2023 and February 2024.The targeted patients were children of up to 18 years of age with pulmonary hydatid cysts undergoing open surgery for hydatid lung disease. Both gender was included. Patients having recurrent disease, Intrathoracic extrapulmonary hydatid cysts, immunocompromised patients and patients having pulmonary tuberculosis were excluded. Patients unfit for surgery were are also excluded. A total of 118 patients were included in the study fulfilling the inclusive criteria.

Data Collection

After taking proper approval from ethical committee (Ref: No. 808/LRH/ MTI) all children who met the inclusion criteria were included is the study. The purpose and benefit of study was explained to the parents/ guardian and informed consent was taken from parents, ensuring confidentiality and fact that there is no risk involved to patient while taking part in this study. A detailed history and physical examination was carried out followed by relevant investigations. Surgery was done after confirming the diagnosis. Patients was observed for complications during admission. Data was collect on preformed proforma.

Data Analysis

Data was analysed with statistical analysing program (SPSS v23.). Mean ± standard deviation was presented for quantitative variables such as age, weight. Frequency and percentages for qualitative variables such as gender, types surgical technique.

RESULTS

A total of 118 pediatric patients with pulmonary hydatid disease received open enucleation with capitonnage during the study's time frame. The study participants were 56.8% male and 43.2% female, and their mean age was 10.4 ± 3.2 years. The common symptoms presented by the patients included cough in 64.4%, chest pain and dyspnea in 51.3% each of the patients in 35.6% of cases, the diagnosis was incidentally revealed radiographically. In the current study, the right lung was most affected, with a percentage of 62.7%, and only 8.5 percent had both lungs affected.

Table 1

Patient Demographics and Clinical Presentation

Variable	Number (n=118)	Percentage (%)
Mean Age (years)	10.4 ± 3.2	—
Gender (Male: Female)	67:51	56.8:43.2
Symptomatic Cases	76	64.4
Asymptomatic Cases	42	35.6
Right Lung Involvement	74	62.7
Left Lung Involvement	34	28.8
Bilateral Involvement	10	8.5

The average percentage of complications after surgery reached 24.6%. Based on frequency of occurrence, surgical site infection was the most frequent, reported in 6.8% of cases, followed by atelectasis (5.1%) and pneumothorax and surgical emphysema were observed in 4.2% of the patients, prolonged air leak 3.4% and 2.5% of patients developed empyema and residual cavity. Surprisingly, no mortality was reported among the patients who underwent surgery in this study.

Table 2

Postoperative Complications

Complication	Number (n=118)	Percentage (%)
Surgical Site Infection	8	6.8
Atelectasis	6	5.1
Pneumothorax & Emphysema	5	4.2
Prolonged Air Leak	4	3.4
Residual Cavity Formation	3	2.5
Empyema	3	2.5
No Complications	89	75.4

The average length of hospitalization was 8.6±2.4 days, but it was longer in patients with complications, 9.1±2.2 days. Patients who developed a prolonged air leak post-surgery had an average length of stay of 12.3 days, and for those with no complications, the average stay was 7.1 days. Thus, after the operation, follow-up for six months in most patients showed that 91.5% had fully recovered without any sign of the disease reemerging.

Table 3

Length of Hospital Stay

Patient Group	Mean Hospital Stay (Days)
All Patients (n=118)	8.6 ± 2.4
Patients with Complications (n=29)	11.8 ± 3.2
Patients without Complications (n=89)	7.1 ± 1.8

These results lead to the assumption that open enucleation with capitonnage is a safe surgical management for paediatric pulmonary hydatid disease with acceptable complications

DISCUSSION

Hydatid pulmonary disease still poses a significant challenge to the health of the people in the endemic areas, especially the children. This study's results contribute to understanding the benefits and risks of open enucleation with capitonnage and emphasize the technique's effectiveness. The outcomes presented in this paper suggest that this surgical strategy for treating children with pulmonary hydatid cysts is effective and safe, mainly if it spares the complication rate and the extent of recurrence. However, some postoperative complications are usually witnessed, like atelectasis, prolonged air leaks

and residual cavities, and therefore, there is a need to discuss their merits and demerits.

Another interesting fact of the study was the distribution of the patients according to their age and gender. This is a mean age of 10.4 years, which supports the idea that this disease mainly affects school-going children, as supported by literature (1). A higher proportion of the subjects were male, with a male and female ratio of 1.3, which is comparable with previous works that have reported a slightly higher prevalence of hydatid disease in male children than females. This study's symptomatic cases (64.4%) warrant early diagnosis and management because hydatid cysts increase and may present with respiratory complaints like coughing, chest pain, and dyspnoea (3). The right lung was more affected, and that can be explained by the differences in the dynamics of airflow through the lungs and structures of lymphatics (4).

Regarding treatment, surgery has remained the mainstay of management of pulmonary hydatid disease with different approaches according to cyst size, location, and involvement of bronchi (5). Thus, the popularity of open enucleation with capitonnage has grown because it reduces postoperative complications by closure of the fistula and residual cavity. On the other hand, one's supplements state that non-capitonnage techniques give comparable results despite the decreased operating time and effort in handling the tissues (7), (8).

This study's overall complication rate of 24.6% is within the usual therapeutic standard for the postoperative treatment of hydatid cysts. The study shows that surgical site infection and atelectasis was the most frequent complication as compared to study done by Boozhmehrani et al (9). Still, other researchers have found the duration of air leaks, indicating that the rate may depend on aspects such as the cyst's size and the surgeons' expertise (10). Other complication like pneumothorax and surgical emphysema (4.2%) were also observed. Above complication can be minimized with proper surgical procedures, sterilization, and postoperative patient care. Formation of residual cavity occurred in 2.5% of the cases, while empyema was noted in 2.5% of the patients hence, the procedure should be done carefully, particularly in young patients (11).

Other necessary measures of surgical care quality include length of hospital stay and length of stay adjusted for complications. The average hospital stay in this study is also in concordance with other studies where children undergoing pulmonary hydatid operation had a hospital stay ranging from 7-12 days due to different complications (12). Those who developed a prolonged air leak or an infection needed a longer hospital stay, an average of 12.3 days, as opposed to the group of patients without complications, 7.1 days. This indicates that there is a need for better improvement when it comes to measures within the operating room to reduce the complications that may arise post-surgery and facilitate early recovery (13). Optimizing the management of the selected patient's postoperative illnesses and other comparable patients and, where possible, applying minimally invasive approaches to surgery could help shorten the stay and reduce the price tag in the hospital (14). Another strength of this research is its favourable placement in the current discussion of the requirement of capitonnage in hydatid cyst surgery. Some publications suggest non-capitonnage techniques because they are associated with shorter operation times and better tissue trauma but with similar recurrence rates (15). Nevertheless, this study's findings align with the idea that capitonnage is still an essential procedure in children and the reduction of postoperative residual cavities. As children possess more distensible lung parenchyma as compared to adults, benefits for capitonnage to accomplish cavity closure can be valued in this category (1).

However, this study has some limitations. The study sample is sufficient for research, but a single-centre study can be problematic due to the restricted generalizability of results. A longer follow-up would yield more definitive figures regarding recurrence and complications rate after five years. Finally, it may be essential to conduct a head-to-head comparison of the capitonnage technique to other forms of techniques employed in the same patient population to produce more conclusive data on the efficacy of the method. Further study should include other centres with more cases with larger sample sizes to confirm these results and to determine the standard protocol for managing paediatric pulmonary hydatid disease (2). Last is an open technique of enucleation with capitonnage to be used frequently and effectively in childhood hydatid lung disease management. Thus, the report supports the role of this technique in preventing postoperative complications. Consequently, such complications as the atelectasis and the average length of hospital stay indicate the necessity for developing further surgical practices. Current evidence and developments can be used to inform future iterations of minimally invasive treatments for paediatric pulmonary hydatid disease to improve patient care and healthcare system effectiveness.

CONCLUSION

Open enucleation with capitonnage is a preferable surgical procedure for treating pulmonary hydatid disease in children because of the less complications and high success rate. The practical benefits of this approach are presented by eliminating residual cavity formation and managing the associated complications of air leaks for an extended period, post-surgical empyema, and pneumothorax. The findings favour capitonnage and can be recommended as a potential treatment method for such cases, especially among children, since lung compliance is critical to the prognosis. Although the technique has benefits, the incidence of complications in the procedure is not insignificant, with an overall rate of 24.6%, further emphasizing the importance of proper surgical technology and postoperative management. The average hospital stay of 8.6 days indicates the condition has a good prognosis, but patients who develop complications stay longer. Large-scale trials and subsequent comparative trials that would include capitonnage and other forms of surgery are required in the future. It can be concluded that open enucleation with capitonnage can still be considered a safe and efficient treatment for hydatid lung disease in children.

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