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EFFICACY AND SAFETY OF PERCUTANEOUS SCLEROTHERAPY IN THE MANAGEMENT OF HYDATID CYSTS

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ABSTRACT

Background: Percutaneous sclerotherapy of hydatid cysts offers a less invasive management of hydatid cysts. The procedure has been documented to yield significant cyst volume reduction of 76%-100%, with up to 100% symptom relief. It is particularly advantageous due to its shorter hospital stay and fewer complications compared to surgery. Long-term follow-up data show that the recurrence rates of percutaneous sclerotherapy are comparable to surgery, but with a safer profile, making it an effective treatment option. Factors like cyst size and location influence treatment success, with smaller cysts responding better. Complications are generally rare, with major adverse events seldom reported.

Objective: To review the efficacy and safety of percutaneous sclerotherapy as an essential treatment modality for hydatid cysts.

Sources: The search strategy involved systematically searching databases such as PubMed, Scopus, and the Cochrane Library. Studies published from 2015 onwards were included, focusing on those addressing percutaneous sclerotherapy for hydatid cysts.

Content: The review provides a comprehensive understanding of the efficacy, safety, and potential complications of percutaneous sclerotherapy of hydatid cysts. This review also highlights the growing role of percutaneous sclerotherapy in hydatid cyst disease management.

Implications: To enhance the integration of percutaneous sclerotherapy of hydatid cysts into clinical practice to complement existing treatment strategies, offering a reliable alternative for managing hydatid cysts.

INTRODUCTION

Hydatid disease, also known as cystic echinococcosis (CE), is caused by the larval stage of *Echinococcus granulosus*, a parasitic tapeworm(1). It is endemic in regions where livestock farming is common, particularly in Mediterranean countries, Central Asia, South America, and East Africa(2). The disease primarily affects the liver and lungs but can involve other organs. Transmission occurs through ingestion of eggs from contaminated food or water(3). Clinically, hydatid disease presents asymptotically or with organ-specific symptoms, and if left untreated, can result in severe complications such as cyst rupture(4). Prevention strategies focus on community awareness, responsible pet ownership, and mandatory reporting(5).

Percutaneous sclerotherapy has emerged as an effective and safe alternative to surgery for managing hydatid cysts. Multiple studies have demonstrated its efficacy, with success rates comparable to or better than conventional surgery(6,7). The procedure involves puncture, aspiration, injection of a sclerosing agent, and re-aspiration (PAIR) for smaller cysts, while larger or complicated cysts may require additional drainage(8). Several advantages include shorter hospital stays, fewer complications, and lower recurrence rates(6,9). Long-term follow-up studies have shown high cure rates, with one study reporting 229 out of 230 patients cured(8). Minor complications such as urticaria and fever may occur. Major complications are rare(7,8). These findings suggest that percutaneous sclerotherapy should be considered as a first-line treatment for uncomplicated hydatid cysts.

METHODS/SEARCH STRATEGY

The search strategy involved systematically searching databases such as PubMed, Scopus, and the Cochrane Library. Studies published from 2015 onwards were included, focusing on those addressing percutaneous sclerotherapy for hydatid cysts. Search terms included "hydatid cyst," "percutaneous sclerotherapy," and "cystic echinococcosis treatment." Inclusion criteria encompassed systematic reviews, case studies, retrospective clinical studies, cohort studies and narrative reviews while excluding studies lacking full-text availability or published before 2015. All studies exploring the procedure's efficacy, safety, and complications were reviewed.

Pathophysiology and classification of Hydatid Cysts

Hydatid cyst disease, caused by *Echinococcus granulosus*, occurs when humans become accidental hosts in the parasite's life cycle(10). After ingestion of eggs, the parasite hatches in the intestines and releases oncospheres, which penetrate the intestinal wall and travel via the bloodstream to organs like the liver and lungs. There, the larvae develop into cysts composed of three layers: pericyst (outer layer), ectocyst (middle layer), and endocyst (inner germinal layer). The germinal layer produces protoscolices, which can cause infection if released into the body (Figure 1). Cyst growth can lead to organ compression and other complications. Diagnosis relies on imaging techniques, serology, and immunological testing(11).

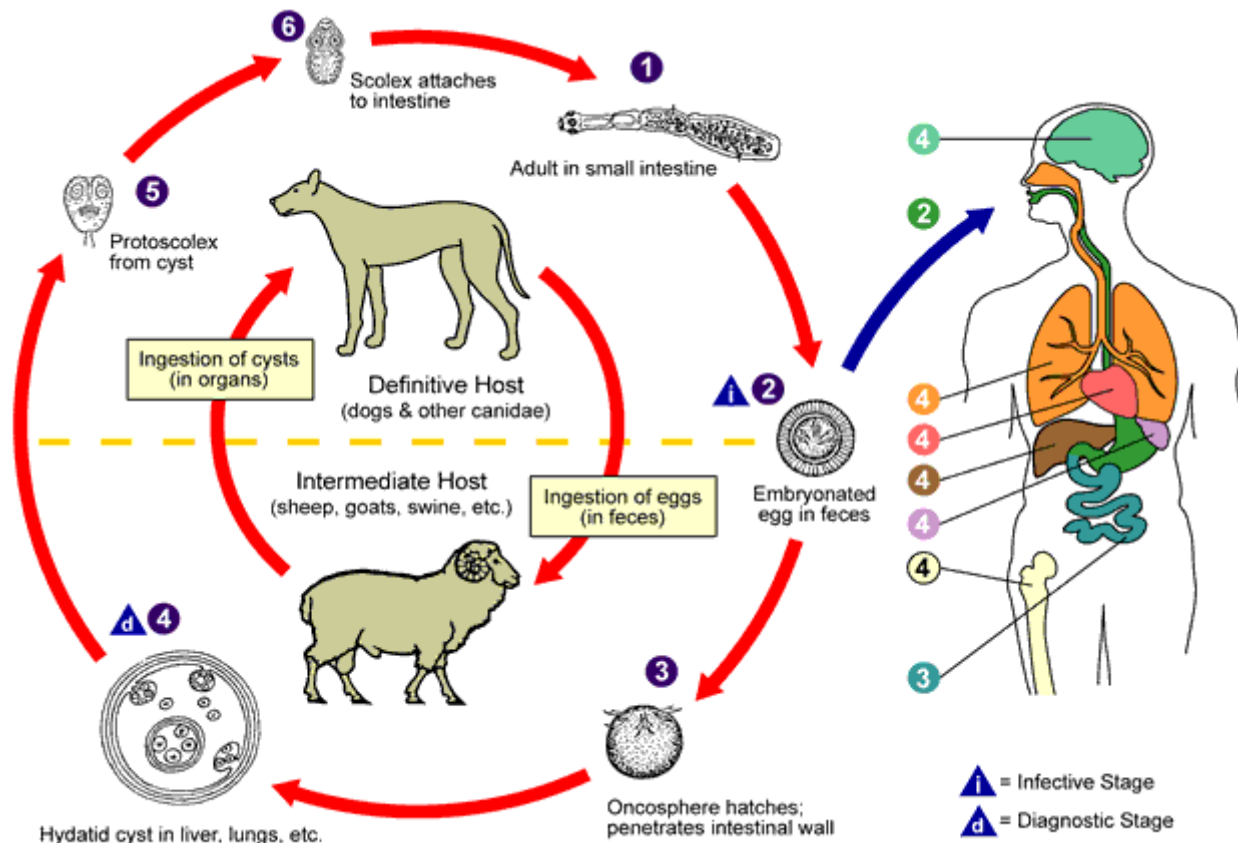


Figure 1: Pathophysiology of Hydatid cyst disease.(12)

The World Health Organization (WHO) classification for cystic echinococcosis (CE) is useful in guiding treatment decisions for various cyst types(13). Puncture, aspiration, injection, re-aspiration (PAIR) or standard catheterization are used for CE1 and CE3a cysts, while modified catheterization (MoCaT)

is employed for CE2 and CE3b cysts, achieving high technical and clinical success rates with minimal complications(14). Other techniques include the Ormeci technique and PAIR with drain placement at the end of procedure (PAIR-D)(15,16).

WHO-IWGE 2001	Gharbi 1981	Description	Stage
CE1	Type I	Unilocular anechoic cystic lesion with double line sign	Active
CE2	Type III	Multiseptated, "rosette-like" "honeycomb" cyst	Active
CE3 A	Type II	Cyst with detached membranes (water-lily-sign)	Transitional
CE3 B	Type III	Cyst with daughter cysts in solid matrix	Transitional
CE4	Type IV	Cyst with heterogenous hypoechoic/hyperechoic contents. No daughter cysts	Inactive
CE5	Type V	Solid cyst with calcified wall	Inactive

Figure 2: Hydatid Cysts WHO and Gharbi classifications. (12)

Efficacy of Percutaneous Sclerotherapy for Hydatid Cyst Disease

PAIR (puncture, aspiration, injection, and reaspiration) is considered safe and effective, offering lower morbidity, mortality, and recurrence rates compared to surgery(17). A retrospective study of 190 patients demonstrated successful percutaneous treatment in all cases, with a mean volume reduction of 77.5% and only 6.3% major complications(7). Another 8-year analysis found no significant difference between percutaneous and surgical treatments regarding complications and recurrence(18). A systematic review also found percutaneous techniques to be non-inferior to surgery in terms of recurrence, with fewer complications and shorter hospital stays(6). These findings

suggest that percutaneous sclerotherapy is a safe, effective, and less invasive alternative to surgery for treating hydatid cysts.

Percutaneous sclerotherapy has demonstrated promising outcomes in managing hydatid cysts. High recovery rates have been reported at 100% (19) and other studies have observed 81.6%(18) and 84%(21) recovery rates respectively. One study showed a 38% overall recurrence rate, but only 7% for cysts under 8 cm, with an intraprocedural adverse event rate of 6%(20). No major complications have been observed(21). Overall, percutaneous treatment is considered safe and effective for hydatid cysts.

Case examples of percutaneous sclerotherapy of hydatid cysts.

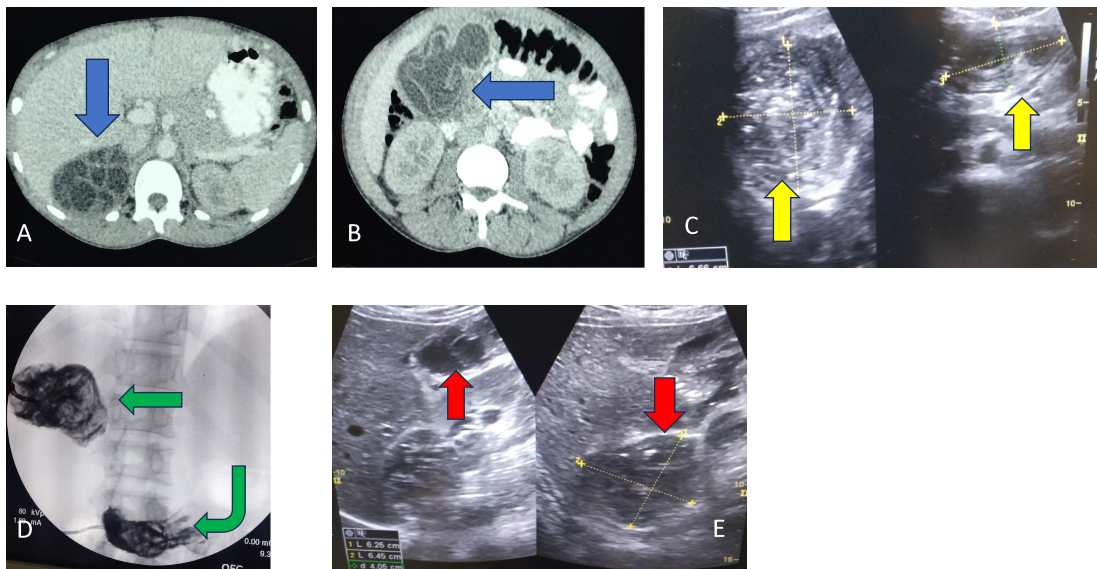


Figure 3: 32-year-old male patient with sub-hepatic hydatid cysts.

A & B – Axial contrast-enhanced CT abdomen scans showing multiseptated cystic lesions with daughter cysts, and B showing membranes – water lily sign (Blue arrows). C – Pre-sclerotherapy grayscale ultrasound images demonstrating the hydatid cysts (Yellow arrows). D – Fluoroscopic cystogram image with the pigtail catheters in situ. Sclerotherapy was done with absolute alcohol (Green arrows). E – Grayscale follow-up ultrasound demonstrating reduced cysts' sizes post-treatment (Red arrows). The patient was continued on albendazole oral medications.

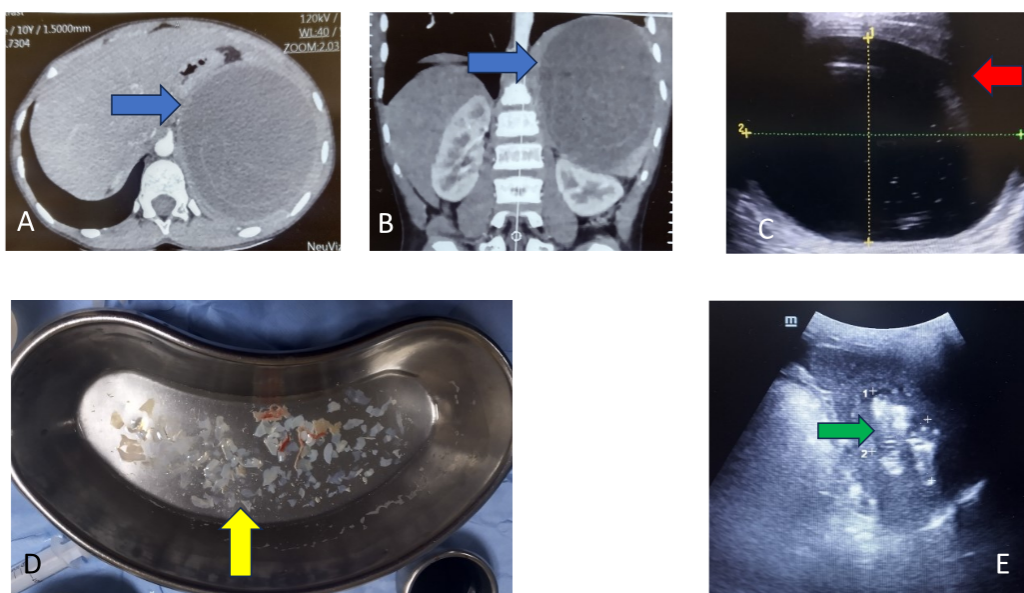


Figure 4: 9-year-old boy with splenic hydatid cyst.

A & B – Axial and coronal contrast-enhanced abdominal CT scan images demonstrating a large splenic hydatid cyst with internal membranes (water lily sign) (Blue arrows). C – Gray-scale ultrasound image demonstrating the large splenic hydatid cyst (Red arrow). D – Hydatid cyst membranes post drainage of the cyst (Yellow arrow). E – Collapsed cyst with internal gas and significant cyst resolution post drainage (Green arrow).

Comparison with Other Treatment Modalities

Percutaneous sclerotherapy has shown promising results compared with surgical interventions. It has demonstrated fewer complications and shorter hospital stays(6,22). A retrospective analysis found no significant differences between percutaneous and surgical treatments regarding complications and recurrence(18). In pediatric cases, percutaneous methods showed effective and reliable results for hydatid cysts (23). These findings suggest percutaneous techniques are a safe and effective alternative to surgery.

Supportive pharmacological treatment is recommended before and after hydatid cyst procedures(24,25). Anti-parasitic medications like albendazole play a crucial role in management(26,27). Albendazole, often combined with praziquantel, can be an effective alternative to surgery for multiple cysts in vital organs(28). Overall, albendazole demonstrates high effectiveness in hydatid cyst management, emphasizing its importance in modern therapeutic approaches.

Novel therapeutic options are being explored, including new drug formulations and repurposed compounds, to address the limitations of current anti-echinococcal drugs(29). Overall, a multidisciplinary approach is recommended to optimize treatment strategies(30).

Complications and Risk Management

Reported complications include hydatid cyst rupture, secondary infection, and allergic reactions. Intra-biliary rupture occurs in 16.14% of cases, intraperitoneal rupture at

0.23%, and allergic reactions, such as anaphylaxis and urticaria, are observed in 1.43% of patients(19). Infectious complications in 30.4% of cases (31). Overall, percutaneous treatment is associated with fewer complications and shorter hospital stays(6).

Multimodality imaging, including Ultrasound(US), Computed Tomography scan (CT scan), Magnetic Resonance Imaging (MRI), and Endoscopic Retrograde Cholangio-Pancreatography (ERCP), play a crucial role in diagnosing and managing complications such as rupture, bacterial superinfection, and mass effect related issues(32). Tailoring the treatment approach to each patient's specific circumstances is essential for reducing complication risks and improving outcomes(25).

FUTURE DIRECTIONS IN RESEARCH

Future research should focus on technological advancements, the use of imaging guidance to enhance the precision and safety of the procedure, and the development of new, more effective sclerosant agents that may improve treatment outcomes(33). Expanding research to include larger cohorts, randomized controlled trials, and extended follow-up periods will help establish more comprehensive guidelines.

CONCLUSION

Percutaneous sclerotherapy is a safe, minimally invasive, and effective treatment option for hydatid cyst disease, with multiple advantages including lower complication rates, shorter recovery times, and cyst reduction. It should be considered as a first line of treatment for hydatid cysts with enhanced integration into clinical practice offering a reliable alternative for managing hydatid cysts.

Credit Statement

C. K. Koech developed the manuscript concept, did literature search, writing of the manuscript and compilation the manuscript.

C. P. Magabe contributed to the manuscript development and gave comments on improvement of the various sections of the manuscript.

Conflict of interest statement

There was no conflict of interest for author 1 in development and writing of this manuscript. There was no conflict of interest for author 2 in development and writing of this manuscript. No external funding was received in the writing of this manuscript.

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