Work in progress report - Pulmonary

A home-made device for safe intraoperative aspiration of pulmonary hydatid cysts

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Abstract

Surgical intervention is still the main modality for the treatment of hydatid disease. Different surgical procedure have been described; however, in the literature there is no collective agreement on the best surgical strategy. For intact pulmonary hydatid cysts, an enucleation or needle aspiration are possible strategies. Though, both methods need careful manipulation due to the serious complications after fluid rupture. Here, we present a novel technique that allows the aspiration of the cyst while reducing the risk of anaphylaxis and dissemination of disease. This is a home-made double suction device designed to aspirate hydatid cysts by creating a low pressure, wide mouth cylinder which holds the cyst wall against the base of the cylinder. A large thoracentesis needle is inserted across the low pressure chamber into the cyst to aspirate the fluid within. The complete evacuation of the cyst makes surgical treatment easier and facilitates its successive removal.

Keywords: Pulmonary; Hydatid cyst

1. Introduction

Hydatid disease, caused by *Echinococcus granulosus*, is a considerable public health problem in endemic countries including the Mediterranean, Middle East, New Zealand, Australia, South Africa, and South America. While it may be discovered in every part of the body, the lung and the liver are the most commonly affected organs [1]. Total excision is the standard therapy. Here, we present a novel technique for aspiration of an intact pulmonary hydatid cyst which reduces the risk of anaphylaxis and secondary infection. The complete evacuation of the cyst makes surgical treatment easier and facilitates its successive removal.

2. Technique

We assembled the device using a transparent plastic cylinder (produced by Becton Dickinson and Company) used by nurses to perform venous blood harvesting. The cylinder is approximately 4.5 cm in length and 2 cm in diameter and is open at its base. The top of the cylinder contains a hole that allows for the connection of a needle (Fig. 1).

First, we closed the top of the cylinder using a plastic luer-lock. Second, we inserted a thoracentesis needle (Needle A) through the top of the luer-lock. Third, we inserted an intravenous needle (Needle B) through the top of the plastic cylinder next to the luer-lock. Fourth, the thoracentesis needle and the intravenous needles were connected to separate suction units using transparent tubes.

The base of the plastic cylinder was placed on top of the cyst. We penetrated the cyst using Needle A. We used Needle B to create a negative depression in the plastic cylinder, thus allowing the tenacious adhesion of the cyst to the cylinder to eliminate the risk of extravasation of liquid during evacuation. A second aspiration was then applied to Needle A to remove the liquid and evacuate the cyst (Fig. 2).

3. Operative application

We performed this technique in July 2007 on a patient with an intact giant pulmonary hydatid cyst of the upper right lobe incidentally discovered in chest radiography. Clinical evaluation was normal, spirometric results showed restrictive ventilation, and specific anti-*Echinococcus* immunoglobulin E test result was positive. The computed tomographic (CT) scan revealed a hydatid cyst (12 cm in diameter) located in the upper right lobe without signs of infiltration (Fig. 3).

A postero-lateral thoracotomy in the fifth intercostal space was accomplished with the patient under general anaesthesia. The patient was placed in the lateral decubitus position and had a double-lumen endotracheal tube. After entering the hemithorax, we identified the giant and intact cyst. By using the technique described, the hydatid fluid was completely aspirated. In fact, the force of suction permitted the strong adhesion of the cylinder to the cystic...
Fig. 1. The photograph illustrates the home-made device.

Fig. 2. Needle A penetrates the cyst. A first aspiration is applied to Needle B to create a negative depression in the plastic tube, thus allowing the adhesion of the cyst to the cylinder. Finally, a second aspiration is applied to Needle A to evacuate the cyst.

Fig. 3. The computed tomographic (CT) scan reveals a hydatid cyst (12 cm in diameter) located in the upper right lobe without signs of infiltration.

wall preventing any spillage that might cause anaphylaxis and dissemination of the disease. After complete drainage of hydatid fluid, we opened the most prominent part of the cyst and removed the membrane. The residual cavity was then irrigated with 10% povidone-iodine solution and cleaned with a suction apparatus. With the application of positive intrapulmonary pressure, air escaping through any bronchial openings was visualized by the formation of bubbles; the orifices were closed with 3-0 absorbable sutures. Pneumocystostomy was obliterated with separate purse-string sutures starting from the deepest level to the surface by the use of an absorbable suture. Two chest tubes (32F) were positioned posteriorly and anteriorly into the pleural space and removed respectively, on the 2nd and 7th postoperative day. The patient was discharged on the 9th postoperative day and Albendazole therapy was started at a dose of 400 mg/day. The patient is presently in follow-up with a good respiratory function and without evidence of recurrent disease.

4. Comment

Surgical intervention is still the main modality for the treatment of hydatid disease. Different surgical procedures have been described such as the enucleation of intact cyst, and cystotomy with or without capitonnage, for complicated or intact cysts [1]. However, in the literature there is no collective agreement on the best surgical strategy. Symbias and Aletras use mainly needle aspiration for cystic fluid during an operation [2], while Halezeroglu and colleagues recommend the enucleation instead of needle aspiration whenever the risks do not outweigh the advantages [3]. Even the role of capitonnage is a matter of discussion. Kosar et al. report that capitonnage is superior to cystotomy because it reduces morbidity [4], while Tuna and coworkers found that there was no advantage to capitonnage, and therefore do not support the technique [1].

In our case we had a patient with a giant intact pulmonary cyst. Kosar et al. define a ‘giant’ cyst as one that exceeds 10 cm in diameter [4]. Total excision is the standard therapy. All hydatid cysts carry a risk of rupture with the possibility of anaphylactic shock and subsequent suffocation. Tuna et al. report the death of one patient for unexpected rupture of an intact cyst during hospitalization [1]. However, in our case, in light of the dimension of the cyst, we were presented with the question of how to remove it safely.

For pulmonary hydatid cysts, an enucleation or needle aspiration are possible strategies. Though, both methods
need careful manipulation due to the serious complications after fluid rupture.

We decided against using enucleation due to the high risk of intraoperative rupture and contamination. Turna et al. report that in 3 of 34 cases where enucleation was utilized, cysts were unintentionally ruptured with recurrence of disease in two of those cases [1].

Simple needle aspiration was also ruled out. The risk of anaphylaxis discouraged us from adopting simple needle aspiration for the evacuation of the cyst because spillage of hydatid fluid around the puncture site may be possible. In the literature, we found a case of anaphylactic reaction following aspiration of a hydatid cyst in the liver during an operation under general anaesthesia [5].

The risks cited after fluid rupture by enucleation and needle aspiration are rare but serious, and prompted us to develop a novel procedure to contain the cyst during surgery. The result was the home-made device depicted in Figs. 1 and 2.

This technique provides an effective control of spillage during the entire time of aspiration of a hydatid cyst. At the beginning of the aspiration, the force of suction allows the strong adhesion of the cylinder to the cystic wall, preventing any spillage of hydatid fluid around the puncture (Fig. 4a). After aspirating a large quantity of the fluid from the cyst, the cyst wall is sucked into the plastic cylinder and forms a watertight plug that ensures the water-proof system (Fig. 4b).

Following complete evacuation of the cyst, we open the most prominent part of the cyst and remove the membrane. Subsequently, for the closure of bronchial openings, we choose to perform the capiçonaggio of the residual cavity for the prevention of prolonged air leak.

In conclusion, the technique described is economic, easily reproducible and simple to use. The components are readily available and easily assembled. Independent of the strategy adopted, the device makes surgical treatment of hydatid cysts easier, particularly with regard to a giant intact hydatid cyst, and permits the complete evacuation of hydatid cysts without any spillage that might cause anaphylaxis and dissemination of disease. However, the application of this device in only one patient could be suboptimal for the justification of usage. Thus, this is a ‘work in progress’ and we hope in the future to describe a large series of cases, even supported by other authors’ experiences, to validate the practice of our instrumentation in surgical treatment of pulmonary hydatid cysts.

References