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Correlation between sizes and intracystic pressures of hydatid cysts[1]

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Abstract

Background: A bicentral prospective study was performed to assess the relationship between sizes and intracystic pressures (ICP) of pulmonary hydatid cysts as well as to compare these measurements in different age groups. **Methods:** A total of 20 patients with 22 unperforated pulmonary hydatid cysts underwent surgery between April 1994 and September 1995. There were 12 males and 8 females with a mean age of 25.7 (7–62). Intraoperatively, ICP's were measured in cmH_2O by direct cannulation. **Results:** Out of a total of 22 cysts, 12 were located in the lower lobes. Mean diameter, volume and ICP of cysts were 9.6 cm (S.D. 4.2), 728.8 cm^3 (S.D. 1014.9) and 36.6 cmH_2O (S.D. 9.3), respectively. There was no significant correlation between various measurements of hydatid cysts, namely their short and long diameters, volumes and intracystic pressures ($P > 0.05$). There was no difference regarding the volume, ICP and age of patients, either among pulmonary lobes or between sexes. Patients who were 20 years old and less, presented a mean cystic diameter of 7.2 cm and mean ICP of 35.1 cmH_2O, whereas the over 20 age group showed results of 11.9 cm and 38.1 cmH_2O, respectively (P values were < 0.0083 for diameter and > 0.05 for ICP). **Conclusions:** Due to the small sample size and a few extreme measurements, the correlation between the sizes and the pressures of hydatid cysts turned out to be insignificant, but it is believed that a positive correlation is most probable with larger sample sizes. On the other hand, while the difference between the mean cystic diameters in age groups of below and over 20 was significant, the pressure difference between them was insignificant. This is why young patients carry the same risk of perforation as adults, although they present with relatively smaller cysts. Therefore, due to the well-known anaphylactic, obstructive and infectious risks of hydatid cyst perforation, urgent surgical removal is always necessary. © 1997 Elsevier Science B.V.

Keywords: Hydatid cyst; Intracystic pressure; Pulmonary

1. Introduction

Hydatid disease has been recognised as a major health problem since ancient times [1]. Hydatidosis is caused by *Echinococcus granulosus* and is endemic in Turkey, as in most other sheep and cattle raising regions of the world, such as Australia, New Zealand, South Africa, South America and the Mediterranean countries of Europe [1–4]. The incidence of hydatid disease in Turkey has been reported to be 20/1 000 000 [4].

There are different kinds of treatment described in the literature, such as medical therapy with albendazole and puncture aspiration injection reaspiration (PAIR) with alcohol [5]. Although some chemotherapeutics are reported to be remarkably effective, the accepted treatment of hydatidosis is still surgical. The diameter of hydatid cysts can increase from a few mm, up to approximately 5 cm in a year and any cyst that grows to a diameter of 6–7 cm must be removed [1].

Rupture of hydatid cysts may have serious allergic, obstructive or infective sequelae. As proposed by Lewall and McCorkel, following an unexpected perfo-

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ration of a hydatid cyst, the extent of parasitic fluid dispersion may change from simple pooling within the pericystic cavity to flooding of the tracheobronchial tree [6]. Burgos also underlines the increased risk of perforation and other related complications for cysts with a diameter of 10 cm or more [7].

The presence of a direct correlation between viable hepatic cyst diameter and intracystic pressure has been reported in abdominal hydatid cysts by Yalin et al. [8]. The objective of this study was to look for a similar correlation in pulmonary cysts and its significance for prognosis.

2. Materials and methods

Between April 1994 and September 1995, 20 patients with a total of 22 hydatid cysts underwent surgery in two thoracic surgery clinics. From this total number of patients, 12 were male and 8 were female. The patients ages ranged from 7 to 62 (mean 25.7). Ages of patients peak in the second decade of life (Fig. 1) as in literature [3].

Of the 20 patients, 2 had perforated pulmonary cyst, this was apart from the patient involved in the study and 2 patients with concomitant hepatic cysts.

Before operations 1–3, the following were performed; serologic tests (immune hemagglutination, Casoni's skin test and Weinberg), peripheral blood smears for eosinophil count, thoracic computerised tomography and abdominal ultrasonography.

Number, diameter, presence or absence of perforation and other organ involvement were also recorded. The perforated and dead cysts were excluded from the study group. The presence of clear intracystic fluid or daughter cysts with scolices was the criteria that supported the viability of the cyst. Similarly, if the intracystic fluid was turbid, the germinative membrane was degenerated or if there was calcification or gross infection of the cyst then it was accepted as non-viable [2].

In all patients, routine posterolateral thoracotomy was used for thoracic exposure. All of the patients were intubated with a single lumen endotracheal tube. The superior surface of the cyst was located and followed by the placement of hypertonic saline (20% NaCl) soaked pads around it. After this preparative stage, the ventilation of the lungs were withheld and cysts were punctured from the apex with an 18-gauge needle which was connected to a simple water manometer and ICP was measured in cmH_2O. During this measurement two strong surgical aspirators were kept ready for an uncontrolled cystic fluid leakage.

After having measured the ICP, as much cystic fluid as possible was aspirated through the 18-gauge needle. Then, the germinative membrane was removed with a ring forceps through a tiny apical incision. The residual cavity was irrigated with saline and bronchial openings were sutured with synthetic absorbable polyglactin material (3/0 vicryl Ethicon) one by one. The pericystic cavity was capitonnated by means of purse-string sutures with the same material. Capitonnage was performed to avoid postoperative infection or formation of bronchopleural fistula as reported by Burgos et al. [9].

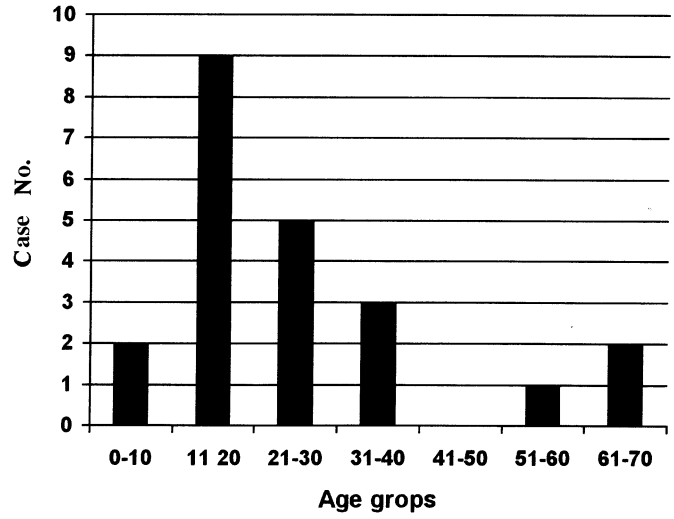

Fig. 1. Case distribution in age groups.

In statistical analysis, the Mann-Whitney test was used in comparing the means of cystic diameter, ICP, age, cystic volume etc. in men and women as well as in different age groups. On the other hand, the Spearman rank correlation was used to search for a probable correlation among cystic diameters, volumes and pressures. Variation of number, diameter, volume and pressures of cysts among different lobes were analysed by using the Kruskal–Wallis non-parametric ANOVA test.

3. Results

All of the 22 cysts were viable and unperforated. Mean diameter, volume and intracystic pressure of cysts can be seen in Table 1. Mean eosinophilia was 4.7% (range = 0–18, S.D. = 4.2). The Casoni's skin test was found to be positive in 50% of cases.

When the cases were separated into two groups as the patients aged 20 and younger and the others aged

Table 1
Diameters, volumes and intracystic pressures of cysts

Cysts	Minimum	Maximum	Mean	S.D.
Diameter	2.5	20.5	9.6	4.2
Volume	8.0	4509.0	728.8	1014.9
ICP	21.0	61.0	36.6	9.3

ICP, intracystic pressure; S.D., standard deviation

Table 2
Comparison between male and female patients regarding the age, eosinophilia and cystic diameter, volume and pressures

Sex	Mean Age	Mean diameter (cm)	Mean volume (cm^3)	Mean ICP (cmH_20)	Mean eosinophilia (%)
Female	28.0	9.1	566	35.3	5.1
Male	22.9	9.9	842	37.5	4.2

over 20, mean diameter of the first group was 7.2 cm whereas that of the second group was 11.9 cm ($P = 0.0083$). Mean ICP of the first group was 35.1 cmH_2O while it was 38.1 for the second group ($P > 0.05$).

A probable correlation between the diameters of cysts and their ICP measurements was searched for by analysing the data but no significant correlation was found. This was also the case for the estimated volumes of the cysts that were calculated by using the arithmetic means of their long and short diameters.

There were no statistically significant differences of cyst diameter, pressure and age of patient among pulmonary lobes. The differences between men and women regarding the volume, diameter and age were not significant either ($P > 0.05$) (Table 2).

Low diagnostic values of serologic tests for hydatid disease have already been reported [4,8]. We also found the Casoni's skin test was positive in only 50% of cases. The peripheral eosinophilia in a normal person is reported as 2.7% [10]. In this study results showed positive eosinophilia in 77% of cases, with a mean of 4.7%.

4. Discussion

Echinococcal cysts always carry the risk of a rupture with anaphylactic potential. Lewall and McCorkell classified the rupture of hydatid cysts as contained, communicated and direct [6]. While in the contained type, the ruptured cystic content is limited within the pericystic cavity, it is connected with the tracheobronchial or biliary system in the communicated type and with the pleural or peritoneal cavity in direct types. Beside the anaphylactic potential, there also exists the spillage risk of echinococcal scolices and daughter cysts to the healthy viscera. To avoid the spillage, starting with formalin and formaldehyde many scolicidal agents have been used [1,11]. Zapatero et al. reported successful 3 min intracavitary use of 10% hydrogen peroxide [12]. However, 5% silver nitrate and hypertonic saline solution (20% NaCl) are the ones that became the most popular [1–3,9]. In this clinic, with the belief that the former is more irritative within the pleural cavity, use of hypertonic saline is prefered. As another safety adjunct, after completing the closed aspiration of the cyst and performing cystotomy, keeping the lungs inflated with a continuous positive endobronchial pressure prevents the leaking hydatid fluid from pooling into the airways through the bronchial openings.

Hydatidosis peaks in early ages of life [13]. This pediatric peak in incidence is due to the relatively higher growth rate of pulmonary cysts than cysts in any other organ, owing to the elastic pulmonary parenchyma [1].

Furthermore, the lungs, by replacing the liver, become the most commonly involved organ in the early decades of life [2,13]. This is also an important contributing factor to the incidence peak of pulmonary hydatid disease in the teenage years of life. In our study, the ages of patients peak at the second decade as well (Fig. 1).

In this study, although cysts in patients younger than the age of 21 were found to be significantly smaller than ones in older patients, their ICP's were still comparable. This also puts further stress on the necessity of early removal of pulmonary hydatid cysts in younger patients.

Although Yalin et al. had shown the positive correlation between sizes and pressures of the abdominal hydatid cysts, in this preliminary report of our prospective study we could not show it in pulmonary cysts. This is thought to be related to the small sample size and a few extreme values. Therefore, we believe that positive results would be obtained with a bigger sample group. It was also intended to compare the ICP measurements of living and dead cysts at the beginning, however no dead cysts were found, only unperforated ones showing calcification or infection and turbid intracystic fluid.

The correlation between sizes and pressures of the cysts were not significant, however, it is obvious that they may reach remarkably high pressures (up to 61 cmH_2O). In addition, the bigger the cyst is the thinner the lung parenchyma surrounding it will be. Consequently, the risk of a direct type of perforation increases with increasing cystic diameter. A potential communicating or a direct type of perforation in turn, carries the disseminative, obstructive or anaphylactic risks with it. Therefore, serious and urgent consideration of surgical intervention is suggested.

Camalote or water-lily sign, formed by the displacement of intracystic fluid when air enters after complete rupture, as well as the floating laminated membrane, is a characteristic of the contained type of rupture. This was not observed in any of the cysts as none were

perforated. Still, it should alert the physician of the need for surgical therapy, as there is the risk of conversion into a communicating or direct type of rupture.

In order to help in differential diagnosis of hydatid disease, a diverse set of serologic tests has also been used. Although Babba et al. reported relatively higher sensitivity results with counter-immunoelectrophoresis and enzyme-linked immunosorbent assay (75.6 and 77.9%, respectively) they were still far from being reliable [13]. High false positivity of the more common serologic tests, such as, Casoni's skin test and Weinberg complement fixation test, is the major problem [1]. Dogan et al. reported a 54% positivity rate for these two tests in their series [4]. In this study, as the hydatidosis was surgically proven in all the patients, none showed any false positive results. However, there was a fairly high number of false negative results (50%).

Another laboratory result that indicates hydatidosis is eosinophilia. Nevertheless, its occurrence is no more than 20–34% [1]. As another handicap, eosinophilia is seen in many other parasitic or atopic pathologies. Therefore, its low sensitivity and specificity preclude its widespread use in diagnosis of the pathology.

It is concluded that surgery should be the first treatment of choice in most cases. The medical therapy should only be considered as a neoadjuvant or adjuvant therapy in combination with surgery, or to provide some benefits to patients who cannot tolerate the operation due to their general clinical conditions.

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