

Diagnosis of cystic echinococcosis: ultrasound imaging or countercurrent immunoelectrophoresis?

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تشخيص داء الكيسات المشوكة: التصوير بفوق الصوت أم الرحلان المناعي المعاكس للتيار

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خلاصة: يُعدُّ داء الكيسات المشوكة واحداً من أهم الأمراض الحيوانية المصدر في جمهورية إيران الإسلامية. وقد أجريت هذه الدراسة في ثلاث من المستشفيات العامة الكبيرة في شيراز، وتم فحص سجلات 1227 مريضاً جراحياً ثبتت إصابتهم بداء الكيسات المشوكة خلال فترة 20 عاماً امتدت من 1978 إلى 1998 ومقارنة النتائج الخاصة بالرحلان الكهربائي المناعي المعاكس للتيار مع التقارير الباثولوجية وتقارير الدراسة بالأصوات فوق الصوتية لمعرفة ما إذا كانت الاختبارات السيرولوجية قد تكون مفيدة في التشخيص. ووجد أن الرحلان الكهربائي المناعي المعاكس للتيار كان إيجابياً في 62.0% من الحالات فيما كانت الباثولوجيا والدراسة بالأصوات فوق الصوتية إيجابية في 96.3% من الحالات. وتؤكد هذه الدراسة مدى فائدة الدراسة بالأصوات فوق الصوتية وأنه ينبغي الاقتصار على الحالات المشتبه في الفحص بالرحلان الكهربائي المناعي المعاكس للتيار لتشخيص داء الكيسات المشوكة.

ABSTRACT Cystic echinococcosis is a major zoonotic diseases in the Islamic Republic of Iran. This study was carried out in 3 general hospitals in Shiraz. We examined the records of all 1227 surgical patients with a surgically-proven diagnosis of cystic echinococcosis for the 20-year period 1978–98. The results of countercurrent immunoelectrophoresis were compared with pathology and ultrasound reports to determine whether serological tests could be helpful for diagnosis. Countercurrent immunoelectrophoresis could detect only 62.0% of cases, whereas the pathology and ultrasound results were positive for 96.3% of cases. This study confirms the usefulness of ultrasound and suggests that only in doubtful cases would countercurrent immunoelectrophoresis be useful for diagnosing cystic echinococcosis.

Diagnostic de l'hydatidose : imagerie échographique ou électro-synérèse ?

RESUME L'hydatidose est l'une des principales zoonoses en République islamique d'Iran. Cette étude a été réalisée dans trois hôpitaux généraux de Chiraz. Les dossiers de tous les patients chirurgicaux, au nombre de 1227, pour lesquels un diagnostic d'hydatidose avait été établi chirurgicalement ont été examinés pour la période de 20 ans allant de 1978 à 1998. Les résultats de l'électro-synérèse ont été comparés avec les rapports pathologiques et ultrasonographiques pour déterminer si les tests sérologiques pouvaient être utiles pour le diagnostic. L'électro-synérèse n'a permis de détecter que 62,0 % des cas, tandis que les résultats pathologiques et de l'échographie étaient positifs pour 96,3 % des cas. Cette étude confirme l'utilité de l'échographie et semble indiquer que l'électro-synérèse n'est utile pour le diagnostic de l'hydatidose que dans les cas douteux.

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Introduction

Echinococcus granulosus in animals and man has been reported in different parts of the Islamic Republic of Iran [1,2]. Surgical reports from the main university general hospitals show a high rate of operations on patients suffering from cystic echinococcosis (CE). In addition to clinical signs and symptoms, the diagnosis of CE has been based mainly on serological tests and various imaging techniques; ultrasound has been used extensively for diagnosing CE in recent years [3]. Among the serological tests, countercurrent immunoelectrophoresis (CCIEP) using whole, pooled hydatid fluid as an antigen has been used to diagnose CE in Shiraz, Islamic Republic of Iran [4].

This retrospective study compared the results of CCIEP tests with the pathology and ultrasound reports from surgically-proven cases of CE in hospitals in Shiraz. The aim was to assess the usefulness of CCIEP in the diagnosis of this disease.

Methods

The study was carried out in the three main general hospitals in Shiraz: the Faghihi, Nemazi and Shiraz hospitals. The hospital records of all 1227 surgical patients with a diagnosis of CE were investigated for the 20-year period from 1978 to 1998. For each patient, the surgery and pathology reports and the results of ultrasound and serology tests were noted, where available. The pathology report was considered to be the 'gold standard' for a diagnosis of CE. The CCIEP tests were carried out in the hospital parasitology departments. Data were recorded on electronic spreadsheets and analysed using the SPSS version 3.0. Statistical comparisons were made using the Fisher exact test.

Results

The distribution of hydatid cysts in various organs was compared with the results of the CCIEP test (Table 1). Out of 157 cases with liver cysts, 101 (64.3%) were positive with CCIEP. The percentage was similar for cases of lung cysts: 93 (64.6%) out of 144 cases.

The typical histopathology of CE showed hydatid cysts with a thick fibrotic wall covering the laminated membrane, sometimes with foci of calcification. The contents showed numerous protoscolices (Figure 1).

The results of the CCIEP test were compared with the pathology findings. Out of 271 cases: 164 (60.5%) were positive with both CCIEP and pathology (Table 2); 4 cases (1.5%) were positive only with CCIEP but negative in pathology; 97 cases (35.8%) were positive only with pathology but negative with CCIEP; and 6 (2.2%) cases were negative with both tests. Thus CCIEP could detect only 168 cases (62.0%) confirmed by pathology.

Table 1 Distribution of hydatid cyst(s) in various organs compared with the results of countercurrent immunoelectrophoresis (CCIEP) tests in 1227 patients with cystic echinococcosis

Site of the cysts	CCIEP positive		CCIEP negative		Total	
	No.	%	No.	%	No.	%
Liver	101	64.3	56	35.7	157	100.0
Lung	93	64.6	51	35.4	144	100.0
Abdomen	7	58.3	5	41.7	12	100.0
Ovary	5	71.4	2	28.6	7	100.0
Other sites ^a	15	71.4	6	28.6	21	100.0

^aKidneys, bones, breasts, brain, heart, spleen and pancreas.

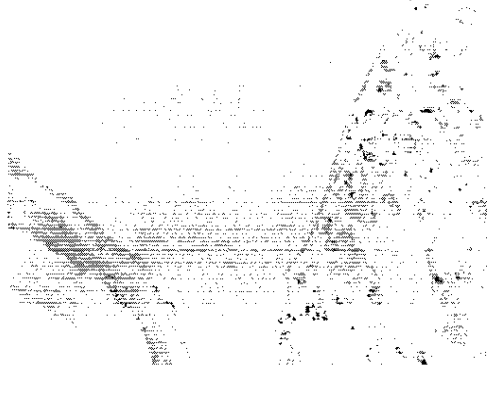


Figure 1 Pathology results from human hydatid cyst showing the laminated membrane and protoscolices (H&E × 650)

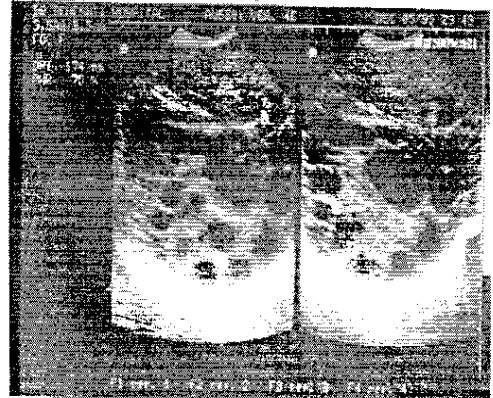


Figure 2 Ultrasound image of a hydatid cyst in the liver showing daughter cysts

With ultrasound, cysts were revealed in echo-free areas with posterior acoustic enhancement. The criteria for hydatid cysts were the presence of daughter cysts (Figure 2), a floating membrane and thin wall and double wall cysts (Figure 3).

The results of ultrasound were also compared with the CCIEP test. Out of 190 cases: 111 (58.4%) were positive both with ultrasound and CCIEP; 72 cases (37.9%)

were positive with ultrasound but negative with CCIEP; 5 cases (2.6%) were positive with CCIEP but negative with ultrasound; and 2 cases (1.1%) were negative with both CCIEP and ultrasound (Table 3).

In pathologically-proven cases when CCIEP and ultrasound results were both available, the following results were ob-

Table 2 Comparison of pathology results with countercurrent immunoelectrophoresis (CCIEP) tests in 271 patients with cystic echinococcosis

Pathology results	CCIEP positive		CCIEP negative		Total	
	No.	%	No.	%	No.	%
Positive	164	60.5	97	35.8	261	96.3
Negative	4	1.5	6	2.2	10	3.7
Total	168	62.0	103	38.0	271	100.0

Fisher exact test = 0.187, P > 0.05.



Figure 3 Ultrasound image of a hydatid cyst showing the floating membrane, with thin wall and double wall effects

Table 3 Comparison of ultrasound results with countercurrent immunoelectrophoresis (CCIEP) tests in 190 patients with cystic echinococcosis

Ultrasound results	CCIEP positive		CCIEP negative		Total	
	No.	%	No.	%	No.	%
Positive	111	58.4	72	37.0	183	96.3
Negative	5	2.6	2	1.1	7	3.7
Total	116	61.1	74	38.9	190	100.0

Fisher exact test = 0.707, $P > 0.05$.

tained: 104 cases (59.1%) were positive both with ultrasound and CCIEP and 67 (38.1%) were positive with ultrasound but negative with CCIEP. In 4 cases ultrasound was negative but CCIEP was positive and in only 1 case were both tests negative (Table 4).

Discussion

This retrospective study compared three methods that can be used for the diagnosis of CE: CCIEP, ultrasound and pathology.

Table 4 Comparison of ultrasound results with countercurrent immunoelectrophoresis (CCIEP) tests in 176 patients with confirmation of cystic echinococcosis from pathology reports

Ultrasound results	CCIEP positive		CCIEP negative		Total	
	No.	%	No.	%	No.	%
Positive	104	59.1	67	38.1	171	97.2
Negative	4	2.3	1	0.5	5	2.8
Total	108	61.4	68	38.6	176	100.0

Fisher exact test = 0.05, $P > 0.05$.

The results demonstrated that only around two-thirds (64.7%) of the cysts in both the liver and lungs were positive with CCIEP and one-third (35.7%) were negative. Usually large proportions of *E. granulosus* cysts are located in the liver (60%); another common site is the lungs (20%). Less common sites are the kidneys, bones, breasts, heart, spleen, pancreas and organs of the head and neck, including the brain [5].

Almost all the available serological tests have been used for the diagnosis of hydatid disease. There are considerable differences between the various tests both in their ability to detect antibodies in the sera of infected persons (sensitivity) and in their capacity to discriminate between patients with echinococcosis infections with other parasites or with other clinical disorders (specificity). There are many factors that must be taken into account when determining which test or tests are most useful in a particular situation. Practical considerations, such as the availability of equipment for carrying out the tests or for purifying antigens, supplies of antigen, the conditions under which tests are to be performed and the skill of operators, may be overriding considerations in determining the test of choice [6]. Strain variations in the parasite, as well as differences in the host-parasite relationship, may also significantly affect the serological response [7].

In this study 60.5% of 271 CE cases were positive with both CCIEP and the pathological report, 35.8% only with pathology, 1.5% (4 cases) only with CCIEP and 2.2% (6 cases) were negative with both procedures. The lack of sensitivity of the CCIEP test could be due to the presence of infertile cysts, the location of the cyst or non-responsiveness of the host to the hydatid fluid antigen used. Using crude antigen in the CCIEP test could be another

contributing factor. Studies with blocking enzyme-linked immunosorbent assay (B-ELISA) tests have shown that only 69% of abdominal hydatid cysts were identified [3].

When comparing the results obtained with ultrasound with the pathology findings, 58.4% of 190 cases were positive with both ultrasound and CCIEP and 37.9% were positive with ultrasound only. Thus the cumulative results of ultrasound were 96.3%, a figure which is comparable to the pathology reports. In the 2.6% of cases (5 patients) that were negative with ultrasound and positive with CCIEP, the cysts could have been located in parts of

the body where ultrasound could not detect them. In most cases, imaging procedures combined with serology will yield the correct diagnosis [8].

We conclude that for low-cost investigations, ultrasound is the diagnostic procedure of choice. However, false positives can occur in up to 10% of cases, the main confusion arising in differentiating between hydatid and benign congenital cysts [8]. With the present imaging techniques, it appears that CCIEP is helpful in the diagnosis of CE only in special cases, such as cysts in special anatomical locations or in doubtful cases.

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