ORIGINAL ARTICLE

DIAGNOSIS OF HUMAN HYDATIDOSIS

PREDICTIVE VALUE OF A RURAL ULTRASONOGRAPHIC SURVEY IN AN APPARENTLY HEALTHY POPULATION

MARIO DEL CARPIO[1], **SERGIO MOGUILANSKY**[2], **MARIA COSTA**[1], **HECTOR PANOMARENKO**[1], **GRACIELA BIANCHI**[2], **SUSANA BENDERSKY**[2], **MONICA LAZCANO**[2], **BERNARDO FRIDER**[3], **EDMUNDO LARRIEU**[3]

[1] *Hospital Rural de Ingeniero Jacobacci,* [2] *Sanatorio Río Negro, Cipolletti;*
[3] *Consejo Provincial de Salud Pública de Río Negro; Viedma, Río Negro*

Abstract The usefulness of ultrasonography (US) in the early diagnosis of hydatidosis, applied in large-scale surveys to populations lacking clinical symptoms of the disease, has been amply documented. However, the rate of false positive and negative results is poorly described. Due to this, the present paper is aimed to evaluate the sensitivity, specificity and predictive value of a conventional rural ultrasonographic survey in comparison with higher imaging complexity. Accordingly, during 1997 and 1998 a total of 1054 children from 7 to 14 years of age were evaluated by means of US, in the town of Ingeniero Jacobacci, Province of Rio Negro, Argentina, employing a portable device for population studies. All detected cases were referred to a high complexity center specialized in imaging diagnosis for their re-evaluation with US, CT scanning and X-rays. A control group comprising 3 children negative by US for each positive case in the mass screening survey was selected and reexamined by US and X-rays and CT scanning in doubtful situations. Twenty-seven asymptomatic carriers were referred with images compatible with hydatid cysts, while 66 were classified as disease free. At reexamination, 24 of those diagnosed as carriers and the totality of those classified as healthy were confirmed. On the basis of our results, a sensitivity of 100%, a specificity of 95.6% and a global test value of 96.7% were estimated.

Resumen ***Diagnóstico de la hidatidosis humana. Valor predictivo de la encuesta ecográfica rural en una población aparentemente sana.*** La utilidad de la ultrasonografía (US) en el diagnóstico precoz de la Hidatidosis, aplicada en la forma de encuestas masivas a población sin síntomas clínicos de la enfermedad es un hecho verificado. Sin embargo se desconoce su tasa de falsos positivos y falsos negativos. Por ello, en el presente trabajo se evalúa la sensibilidad, especificidad y valor predictivo de la encuesta ultrasonográfica rural. Para ello, durante 1997 y 1998 se evaluaron mediante US 1 054 niños de 7 a 14 años de edad, de la localidad de Ing. Jacobacci, Río Negro, Argentina utilizándose para los estudios poblacionales un equipo no moderno y un operador no especializado en diagnóstico por imágenes. Todos los casos detectados fueron derivados a un centro de alta complejidad especializado en diagnóstico por imágenes para su reevaluación con US, Tac y Rx, consideradas en su conjunto como prueba de oro. Se seleccionó un grupo control constituido por 3 niños negativos por US por cada caso positivo. Este grupo fue también reexaminado por US y Rx, y TAC en situaciones de duda. Se derivaron 27 portadores con imágenes positivas y sin síntomas clínicos de hidatidosis y 66 clasificados como no portadores, confirmándose al reexamen 24 de los diagnosticados como portadores y la totalidad de los clasificados como sanos. En función de los resultados se estimó una sensibilidad del 100%, una especificidad del 95.6% y un valor global de la prueba de 96.7%.

Key words: hydatidosis, diagnosis, predictive value

Currently, ultrasonography (US) is the most widely employed diagnostic tool for human hydatidosis[1-3]. Its capacity to detect small cysts in asymptomatic carriers, as well as the feasibility of transporting small, portable equipment to rural areas where this disease is endemic, have made it the method of choice for mass screening.

As from 1984, field studies have been reported in Argentina, Kenya, Tunisia and Uruguay, carried out to evaluate the prevalence of the disease in populations at risk and to provide early medical treatment for detected carriers[1, 2, 8, 11].

These studies have allowed the sensitivity of US to be assayed in relation to serology, traditionally used in field surveys, to find that it is 73% greater than double arc five diffusion test (dd5) and 49% higher than enzymoimmunoassays (EIA). Its specificity has been reported to be 96%[2, 4, 5].

The possibility of routine use of US in hospitals and sanitary units of low complexity, has been appropriately

proposed in a technology scheme adapted to primary health attention programs.

Accordingly, the present work was carried out to analyze the specificity, sensitivity and predictive value of US surveys in an apparently healthy population under operative conditions of rural work.

Materials and Methods

During 1997 and 1998 a total of 1070 children from 7 to 14 years of age were examined. This population comprised the totality of children attending urban and rural schools in the town of Ing. Jacobacci, Province of Rio Negro, in the south of the Argentine Patagonia.

The field study was performed with a portable real-time Sigma XR Kontron device with a Polaroid recording system. The operator was a local physician not specialized in ultrasonographic diagnosis.

All cases presenting images compatible with hydatidosis were referred to a specialized center of imaging studies located in the town of Cipolletti, Province of Rio Negro, and evaluated in a definitive study, based on combined reexamination by means of US with an Aloka 1700 device, front and profile X-rays and on-line CT canning.

A control group, comprising 3 US-negative children in the field study for each positive case, was randomly selected, matched by age and school of origin. This group was also referred to the town of Cipolletti, and subjected to the same reexamination (US and TAC in doubtful situations).

Estimates of sensitivity, specificity, predictive value and global value, as well as of ROC curve parameters, were performed with Epidat 2.0 software.

Results

In the field study, 28 asymptomatic cases (2.6%) of children with cystic images compatible with hydatidosis were detected, 26 corresponding to the hepatic localization and 2 to splenic localization.

Reexamination was carried out in 27 cases (96.4%) and allowed confirmation of 24 (88.9%) as hydatid cysts and elimination of 3 (11.1%) as non-hydatid.

The protocols of the three eliminated cases were as follows:

a) Case 1. Field study: hepatic hydatid cyst, 2.5 cm x 2.10 cm. Definitive study: presence of hydatid formations not demonstrated at US or CT.

b) Case 2. Field study: splenic hydatid cyst, 5 cm x 5 cm. Definitive study: presence of hydatid formations not demonstrated at US or CT.

c) Case 3. Field study: splenic hydatid cyst, 3.7 x 4 cm. Definitive study: presence of hydatid formations not demonstrated at US or CT.

As regards controls, it was possible to refer a total of 66 children, the diagnosis being confirmed in all cases.

On the basis of these results, field studies for all localizations were estimated to present a sensitivity of 100%, a specificity of 95.6% and a global test value of

TABLE 1.– *Sensitivity, specificity and predictive value of the rural ultrasonographic survey on hydatidosis in the Province of Rio Negro, Argentina, 1999*

Parameter	Percentage	Confidence interval (95%)
Sensitivity	100	82.8-99.6
Specificity	95.6	86.9-98.8
Positive predictive value	88.8	69.7-97.1
Negative predictive value	100	93.1-99.8
ROC curve global value	0.97 (SeM 0.001)	
Global test value	96.7	90.29-99.1

96.7%, provided that an individual should be correctly classified by the test (Table 1).

For liver localization, sensitivity was 100%, specificity 98.5% and global test value 98.9%.

Discussion

Attempts of early diagnosis of hydatidosis in human populations where the disease is endemic are considered of particular interest, as a sanitary strategy to improve prognosis of the carrier (feasibility of initiating chemotherapeutic or surgical treatment before the cystic mass induces severe lesions in affected viscera) or to increase the knowledge of its natural history[6].

These activities have been carried out by immunological methods or with or without US by images as massive screening surveys in populations at risk[1, 2, 6-11].

Surveys based on the detection of images compatible with hydatidosis by ultrasonography represent a high diagnostic yield in comparison to serology, as they are able to identify a greater number of asymptomatic carriers, reaching a ratio of 5/1 vs double diffusion five (dd5), of 3/1 vs enzymoimmunoassay (EIA) and of 12/1 vs X-rays[1, 2, 5, 9].

During 1984 and 1986 some of us[2, 5] performed 29 320 ultrasonographic studies in school, conscript and rural populations resident in endemic rural areas of several provinces in Argentina. Out of the total, 239 (8%) were classified as positive for presenting images compatible with the disease. In some cases subsequent surgical interventions led to a diagnostic specificity of 93% for all localizations and of 96% for the liver localization alone. Cases not confirmed in this study consisted of a non-hydatid simple renal cyst and a choledocal cyst[4].

The results of the present experience confirm the sensitivity and specificity of ultrasonography as a mass screening tool in remote rural areas[4, 11]. Their high predictive global positive value ensures a very low unnecessary referral of patients to faraway urban centers

in the absence of therapeutic decisions, with the subsequent decrease in the cost of health services. Besides, its predictive negative value approaching 100% guarantees that all hepatic hydatid cyst carriers will be properly diagnosed.

Its low operative cost, speed and accuracy in obtaining results even with non-specialized operators and simple equipment validates US screening as the method of choice for early diagnosis of human hydatidosis in populations at risk.

References

1. Frider B, Larrieu E, Odriozola M, Vargas F. Catastro ecográfico, serológico y radiológico de hidatidosis humana. Aportes a un programa de control. *Acta Latinoam Gastroenterol* 1985; 4: 199-211.
2. Frider B, Losada C, Larrieu E, Zavaleta O. Asymptomatic abdominal hydatidosis detected by ultrasonography. *Acta Radiol* 1988; 29: 431-4.
3. Frider B, Larrieu E, Corti O. Frecuencia de las localizaciones hepáticas y pulmonar del quiste hidatídico en pacientes sintomáticos y en portadores asintomáticos de áreas endémicas. *Rev Iber Parasitol* 1988; 48: 149-53.
4. Frider B, Ledesma C, Odriozola M, Larrieu E. Especificidad de la ecografía en el diagnóstico precoz de la hidatidosis humana. *Acta Gastroent Lat Amer* 1992; 20: 13-15.
5. Frider B. Liver hydatidosis. *Acta Latinoam Gastroenterol* 1996, 26: 199-200.
6. Frider B, Larrieu E, Odriozola M. Long-term outcome of asymptomatic liver hydatidosis. *J of Hepatology* 1999; 30: 228-31.
7. Larrieu E, Guarnera E, Costa M, et al. Control de la hidatidosis en la Provincia de Río Negro. Evaluación actividades atención médica. *Rev San Hg Púb* 1993; 5: 377-84.
8. Larrieu E, Frider B, Andreani G, Aquino A, De La fuente R. Hidatidosis Humana: ecografía de campo para la determinación de grupos de alto riesgo en la evaluación de un programa de control. *Rev Inst Trop Sao Paulo* 1989; 31: 267-70.
9. Mlika N, Larouze B, Gaudebout C, et al. Echotomographic and serologic screening for hydatidosis in a Tunisian Village. *Am J Trop Med Hyg* 1986; 35: 815-7.
10. Perdomo R, Parada R, Alvarez C, et al. Estudio epidemiológico de hidatidosis. Detección precoz por ultrasonido. *Rev Med Uruguay* 1990; 6: 34-47.
11. Saint Martin G, Larriecu E, Chiesa C. Ultrasound scanning as a screening technique for hydatidosis in developing countries. *J Clin Ultrasound* 1988; 16: 200-4.

- - - -

Human beings are incalculable and he is a fool who tells himself that he knows what a man is capable of.

Los seres humanos son incalculables y es tonto el que piensa que sabe todo lo de que un hombre es capaz.

William Somerset Maughan (1874-1965)

The Book-Bag In: Great English Short Stories, edited by Christopher Isherton, New York: Dell, 1957, p 306