Comparison of some electrolytes in hydatid cyst fluid and serum of liver hydatidosis of sheep

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Abstract
In this study, we collected 100 samples of liver hydatid cyst and blood of infected sheep from the Ahvaz abattoir. The existing Ca, P, Mg, Na and K were measured by an auto analyzer apparatus. The result of T. student test showed that there are a significant difference between serum and fluid of cyst in all electrolytes ($p<0.05$). There was also a significant difference between these electrolytes in infected sheep and normal sheep ($p<0.05$). These results confirmed that the entrance of essential electrolytes have depended on selective permeability and parasite requirement. Ca and P have vital roles in the prevention of hydatid cyst fluid acidity. Understanding parasite nutrition behavior would help us to conduct a better drug treatment in inoperative cyst via selection of effective drug and adherence of this drug to biological material that promote distribution of drug to the cyst.

Keywords: Hydatid cyst fluid, Electrolytes, Sheep hydatidosis

Introduction

Hydatid cyst disease is caused by larval stage of *Echinococcus granulosus* in human and domestic animals. Adult worm lives in small intestine of dogs and Canidae as definitive hosts. The length of worm is 4-7 mm and the maturation period is 55-60 days. Worm excretes one proglotid, which contained 2×10^2-1×10^3 eggs every two weeks. The environment is contaminated with more than billions eggs daily [1]. There are four species of *Echinococcus* including *E. granulosus, E. multilocularis, E. oligartus* and *E. vogeli*. An important species is *E. granulosus* with wide distribution in the world and Iran. The other species belong to special area in the world with more or less geographic distribution [1].

Many investigators in Iran evaluated the prevalence rate of infection in domestic animals. Prevalence of infection varies from 5-10% in small domestic animals such as sheep and goats, and in cows and ox 20% and 40% respectively. There are some studies in human rate infection with a high prevalence in the Khorasan province (seven cases in 10^5 populations) and the least is in the Sistan and Bluchestan province (0.5 cases in 10^5 populations) [1]. There are some aspect of economic loss and hygienic importance in hydatid cyst disease. The economic loss consists of direct and indirect

economic damages in livestock that are estimated millions dollars per year. The disease causes a cost loss due to hospitalization, inability, and death in people [1].

The cyst can implant in various and all organs of the body including liver (70%), lung (22%), and other organs such as heart, brain, kidney, spleen, muscle, skeletal system, skin and many parts of the body (8%). There are essential and vital elements in the cyst fluid that are very important in the biology of parasite. The composition of cyst content may differ in various area and strains. The composition of hydatid cyst fluid is nearly 90%, the same as host serum. The various electrolyte, enzymes, proteins, lipids, vitamins and hydrocarbons were seen in hydatid cyst fluid [1]. The relationship between parasite and host is very important for researchers' attention. Understanding how parasites can grow in the body and what are the requirements of parasites are, can be, useful in understanding the ways for prevention of the parasite.

There is no more information on cyst composition and the existing data belong to pervious studies of many years ago. For example, the first time record pertaining to Mazzocco [2] and Von brand *et al.* [3] that identified the various electrolytes in hydatid cyst fluid. Macmanus and Smyth [4] detected large amount of hydrocarbon molecules such as glycogen and polysaccharides in hydatid cyst fluid. Other researchers were also detected urea and uric acid [5], total protein and nucleic acid [6], globulin like host [7], lipids compound such as phospholipids derivate, monoglycerides, diglycerides, triglycerides and cholesterol [8]. In this study we attempt to identity some electrolytes of cyst fluid and compare them with the serum level of infected animals.

Materials and Methods

One hundred liver hydatid cysts were collected from infected sheep in Ahvaz abattoir. For comparison of content of hydatid cyst fluid and serum, blood samples were also collected. Samples were carefully transported on ice to parasitology laboratory of medical school. The cyst fluid was aspirated by sterile needle in aseptic condition and was centrifuged at 10^3 rpm for five minutes then supernatant fluid was stored in -20^{o}C until use.

The blood samples were centrifuged for getting serum and they were stored in -20^{o}C too. After collection all of samples, level of Ca, Mg, K, P and Na in hydatid cyst fluid and serum of infected sheep were measured by the auto analyzer apparatus (Elan Auto analyzer Eppendreuf Germany and Pars Azmoon kit). Na and K were measured by flame photometry technique. Measurement method for detection of Ca, P and Mg was performed by cresol phetaloin, molibdate reductase and zylidile blue respectively. The student T. test (paired sample 2 tailed) was used for statistical method.

Results

The levels of the electrolytes in hydatid cyst fluid and serum samples are shown in tables 1 and 2.

Table 1: The amount of electrolytes in hydatid cyst fluid in sheep infected with hydatid cyst

	No	Min	Max	Mean	Std.
Ca	100	9.00	9.90	9.4490	0.21106
P	100	0.50	0.90	0.8020	0.10048
Mg	100	2.00	2.50	2.1500	0.10200
Na	100	115.00	129.00	121.9300	2.67897
K	100	4.00	4.80	4.2450	0.17487

Table 2: The amount of electrolytes of serum from sheep infected with hydatid cyst

	No	Min	Max	Mean	Std.
Ca	100	9.00	10.80	9.6030	0.30763
P	100	3.30	5.20	4.6200	0.25702
Mg	100	2.20	3.10	2.5890	0.18417
Na	100	119.00	134.00	125.8900	2.98445
K	100	4.00	4.90	4.3740	0.21725

In the present study we found a significant difference between level of electrolytes in infected sheep and normal range in healthy individuals (P<0.001) (Table 3). Table 4 indicates that there are significant difference between hydatid cyst fluid and serum in level of all studied electrolytes (P<0.001). The means number of all electrolytes in serum are higher than hydatid cyst fluid except K.

Table 3: The amount of electrolytes in serum of infected sheep and normal sheep P<0.001

	Ca	P	Mg	Na	K
Normal rang	12.8-11.5	7.3-5	2.8-2.2	141-161	9-5.4
Test group	9.6030	4.6200	2.5890	125.8900	4.3740

Na and K were measured by Meq/L and Ca, Mg and P by milligram/dL

Table 4: comparison of electrolytes in hydatid cyst fluid and serum of infected sheep with liver hydatidosis (P<0.001)

		Mean	Std	P. Value
Pair 1	Ca (H) Ca (S)	-.1540	.39859	P<0.001
Pair 2	P (H) P (S)	-3.8180	.27538	P<0.001
Pair 3	Mg (H) Mg (S)	-.4390	.17632	P<0.001
Pair 4	Na (H) Na (S)	-3.9600	3.80303	P<0.001
Pair 5	K(H) K(S)	-.1290	.25037	P<0.001

Discussion

A major part of the study on hydatid cyst emphases on structure, antigenic characteristics for diagnosis, treatment and epidemiology aspect but there is little knowledge about composition of hydatid cyst fluid. George *et al.* [9] indicated that the amount of Ca and Mg in protoscolex of hydatid cyst were more than hydatid cyst fluid while Cl and Na were the most ions in hydatid cyst fluid. The important role of Ca and P are for preventing the acidity of hydatid cyst fluid and they are found as calcareous body in the cyst [9].

The level of the RNA and DNA was measured in protoscolex and hydatid cyst

fluid. Results confirmed that RNA and DNA in protoscolex due to parasite metabolic activity so production of parasitic protein was more than hydatid cyst fluid [9]. Ammonia pattern so was liked former. The reverse pattern of distribution was observed in urea, uric acid, creatinine and bilirubin. The proteins of cyst fluid were mainly albumin and globulin, the latter having always double the concentration of the former. Albumins and globulins also formed four of protoscolex protein. Among enzymes, LDH, phosphatases, GOT and GPT exhibited high activities. Cholesterol, cholesterol esters, mono-, di- and triglycerides, fatty acids and phospholipids were detected mainly in the protoscolices with phospholipids constituting the major portion. The carbohydrates of the protoscolices were glycogen, trehalose, glucose and alkali stable carbohydrates. Of particular interest was the detection of sucrose in both protoscolices and fluid [9-11].

Identification of composition of cyst is useful for detection of different strains of *E. granulosus* in endemic area such as Iran. Different strains of *E. granulosus* have been found in endemic areas of Iran. This variation has a significant value in the field of medical parasitology for control and prevention of the disease. Quantitative differences were observed in the levels of Na, glucose, urea, and alanin aminotransferase in liver cystic fluids obtained from different hosts, although these differences were not statistically significant. However, differences in the levels of K, Ca, triglycerides, cholesterol, uric acid, creatinin, albumin, gamma glutamyl transferase, aspartat, aminotransferase and creatinine phosphokinase in different hydatid cyst fluids were statistically significant ($P<0.05$). Differences in biochemical composition of different hydatid cyst fluids suggest the possible existence of more than one strain of *E. granulosus* in human and other intermediate domestic animal hosts in endemic areas [12].

The analysis of liquid aspiration of suspended cyst and identification of electrolytes can be useful for hydatid cyst diagnosis from other non parasitic cyst in human [13]. The serum and cyst fluid levels of Se, Zn and Cu were investigated in patients and sheep with hydatid cysts. Results were compared with those of healthy subjects in both species. Selenium was not detectable in cyst fluid, while Cu and Zn levels were found significantly lower than serum levels. Variations in serum Cu, Zn and Se levels were insignificant with regard to the genus of the host and the fertile capacity of the hydatid cyst [14].

This study show that means level of Ca, P, Na and K of infected sheep serum is less than the normal range. It may be because parasite uses electrolyte for production of calcareous body in cyst. There is a significant difference between two other groups else Mg. There are significant differences between cyst fluid and serum of infected sheep in all of electrolytes level ($P<0.001$). Amounts of electrolytes in serum were higher than cyst fluid. Other investigators have studied the measurement of electrolytes. Vidor *et al*. [15] explained that Na, Cl, and bicarbonate in hydatid cyst fluid were the same as serum but Ca and K were more in hydatid cyst fluid and phosphate were reverse. Cholesterol was one-tenth as plasma level. Sugar unit as galactose, glucosamine and mocopolysaccharide was detected from laminated layer of hydatid cyst [16].

Conclusion

These results indicated that the entrance of electrolytes to cyst is based on parasite requirement. The complex layer of cyst has an important role in the transformation of nutritional material from serum to cyst. Knowledge of parasite nutrition behavior can help us to drug treatment in inoperative cyst via selection of effective drug and adherence of them to biological material that promote distribution of drug to the cyst. Beside, identification of cyst fluid composition helps

us to recognize of the hydatid cyst from non-parasitic cyst and explanation of different strain of parasite in one endemic area.

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