Histopathological Study of Liver Tissue in Infected Sheep with Echinococcosis

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ABSTRACT

The present study deals with histopathologically of sheep liver infected with hydatid cysts caused by from Echinococcus granulosus. The pieces of liver were fixed soon after they taken out from the animal’s body and sections prepared and stained with haematoxylin and eosin (HE), then were examined microscopically. The cysts were differ in size and intensity of histopathological changes proportional inversely with the size of cyst. The pathological changes appeared clearly in regions close to the cyst wall and the microscopic examination showed that the hepatocytes were deformed in size and shape due to reduced cytoplasmic contents and many gaps were seen around the fibrous cyst wall, also showed nuclear pyknosis and elongated cells in some area of tissue. These effects were seen at the distance from the cysts wall. also there were some fibrotic tissue near the cyst wall with some areas of calcifications. The present study indicated that the hydatid cyst fluid produced high toxic effect in tissue surrounding the cysts caused by both histopathologically and mechanically changes.

INTRODUCTION

Echinococcosis is a zoonotic infection caused by cestodean species of the genus Echinococcus. (1) The majority of the hydatid cysts affect the liver followed by the lungs, brain, peritoneal cavity kidneys and bone marrow and other organs. Thoracic complications of hepatic hydatid cysts result from the proximity of hydatid cysts to the liver. (2) Echinococcosis is manifested as disease of variable morbidity

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and mortality depending upon the species or the strain, and occurs almost universally in the liver (about 75% of cases), however some other organs are also involved: lung 9%; muscle 5%; spleen and kidney about 2%; brain 1.5%; bones 1%, heart less 1% and other sites, 3.5%.

Cystic Echinococcosis (CE) is caused by the metacestode stage of various strains of *E. granulosus*, (4) which is a cystic structure typically filled with a clear fluid (hydatid fluid). About 5 days after ingestion of eggs, the metacestode is a small vesicle (60 to 70 μm in diameter) consisting of an internal cellular layer (germinal layer) and an outer acellular, laminated layer(5). This cyst (endocyst) gradually expands and induces a granulomatous host reaction, followed by a fibrous tissue reaction and the formation of a connective tissue layer (pericyst).(4,6)

The present study deals with histopathological changes in liver tissue that infected with hadatid cysts and compare with normal tissue of liver as control.

**MATERIALS AND METHODS**

Sheep liver biopsy infected with several hydatid cysts and uninfected liver tissue were extracted. Sections of the liver including the infected and uninfected parts were prepared for examination. For histopathological examination, tissue samples were taken from liver of sheep. Samples were fixed in buffer formalin 10% by routine method and then histopathological section was prepared. Samples were stained by hematoxylin and eosin (HE) and finally were observed under the microscope.

**RESULTS AND DISCUSSIONS**

Histological examination revealed metacestodal tissue in all liver samples. Parasitic cysts noticed of an outer laminated layer, an inner germinal layer. The cellular laminated layer was either nondisrupted and lined a cystic vesicle or was fragmented and often presented as a convoluted structure and it stained eosinophilic to rarely orange on HE stain. Fig.(1)

The histopathological study of tissue including the cysts showed that the tissue contains very small cysts with considerably thick wall and its germinal layer was covered by laminated layer the cyst contains little amount of cyst fluid but the protoscolexes were absent (Sterile cysts).

The hepatic cells were changed in shape and size and compressed with disturbed arrangement as compared with cells in the normal
hepatocytes. Fig.(2a,b) The hepatocytes surrounding the cyst wall have undergone necrosis, while nuclear and cell membranes were dissolved. The nuclei were not clearly visible in compact cyst wall but were visible in loose tissue. Hepatic nuclei were elongated, dark and solid showing indications of pyknosis. Fig.(3a)

There were some indications of abnormal cytoplasmic vacuolation in the area beyond the fibrous tissue. Some of the hepatocytes were deformed due to reduced cytoplasmic contents and large gaps in tissue were also seen around the fibrous cyst wall, and the cell membranes were not discernible. Fig.(3b) Slight disturbance in the normal hepatic architecture was visible. Also there was a well pronounced fibrous tissue layer around the laminated layer of the cysts Fig.(3a,4) This layer seemed to be formed by highly compressed cell in which the cell membranes had been obliterated. It is mostly seen in the liver symptoms of necrosis of the central portion of the cyst with abscess formation. The necrosis is thought to be due to thrombosis of the vessels in this area. Figure (5) shows some of calcification areas in some regions near the cyst wall.

Figure-1:(a) Showing liver tissue contains very small cysts, there is little amount of cyst fluids but the proscoclexes are absent (Sterile cysts) (b) fibrous tissue (c) and some of calcification area (400X)

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Figure-2: a) Normal liver tissue showing central vies and hepatocytes at (100X) b) Infected liver tissue at (400X)

In the present investigation it was noted that the presence of many small cysts particularly have simple or no effect on the liver tissue that some cells and their arrangement remained more or less normal with functional and normal nucleus. This was expected because at this stage neither the size of the cyst is large enough nor the host tissue has been exposed to high quantities of hydatid fluid (7). Two facts were already known that the cyst wall is permeable and that when released in the body the hydatid fluid can induce a severe anaphylactic reaction in
the body. Normally smaller amounts of hydatid fluid is constantly flow out of the cyst into host tissue, therefore, the host tissue is constantly exposed to HCF in very small quantities. (8)

As the cyst grew in size the cells around the cyst showed a pressure atrophy so the cell membranes were destroyed and nuclei became elongated, pyknotic and the progressive fibrosis that showed in damage of the tissue, this result was compatible with many investigates (7,9)

Around some of the cysts the host tissue showed fibrosis and cirrhosis due to the effect of hydatid fluid seeping out of the cyst wall. However it appeared that discernable effects were only provided after long exposure to the fluid (10).

Figure 3: Liver tissue infected with hydatid cysts.(at400X) a) Showing hepatocytes surrounding the cyst wall have undergone necrosis b) Showing hepatocytes with elongated and pyknotic nuclei. There are some indications of abnormal cytoplasmic vacuolation in the area beyond the fibrous tissue

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Figure 4: Showing pronounced fibrous tissue layer around the laminated layer of cysts, formed by highly compressed cells in which the cell membrane has been obliterated and hepatic nuclei pyknosis.(at100X)

Figure 5: showing some of calcification area were seen in some regions near the cysts wall, and fibrotic tissue.(at400X)

The HCF with /without autolysis based upon proteolytic enzymes are definitely in action that damage the plasma membranes of hepatocytes and interfere with the permeability of the plasma membrane. This resulted in the seepage of cytoplasmic enzymes, metabolites and plasma content out of cell membrane. In hepatic echinococcosis, the liver tissue reaction to the hydatid cysts consists in formation of fibrosis and marked inflammatory changes around the cysts. They may initiate reactive hepatic changes (nonspecific reactive hepatitis)(2,11)

It is mostly seen in the liver symptoms of portal hypertension and necrosis of the central portion of the cyst with abscess formation. The necrosis is thought to be due to thrombosis of the vessels in this area (9).
It has been shown earlier that mast cells are a source and a main inducer of fibroblast and epithelial growth factors in tissue of liver that infected with hydatid cysts (12).

As conclusion, in sheep liver biopsy infected with hydatid cysts, the pathological changes of liver tissue surrounding the cysts were:

• presence of sterile hydatid cysts with cyst fluid.
• Presence of necrosis including damage in hepatocytes and changing in their shapes.
• Presence of fibrosis tissue around the cysts.
• Presence of calcification among the cysts.
• No histopathological changes in other parts of liver normal tissue.

REFERENCES


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