

IS BILE SCOLECIDAL?

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ABSTRACT

Spillage of scoleces is a major problem in surgery of hydatid cysts, because each of them may develop into a new cyst if it settles on a suitable site such as the peritoneum. Many surgeons believe that scoleces in ruptured hydatid cysts of the liver containing bile are not able to develop new cysts, because bile kills them. In order to prove this idea, the viability of scoleces in such cysts was assessed and the effect of bile on live scoleces of unruptured liver cysts of sheep and human beings was also assessed in the laboratory. It was concluded that bile is not scolecidal, and an unfavorable environment is the cause of death of the scoleces. Scoleces in ruptured cysts may be alive and able to develop a new cyst. Therefore the surgeon should use all necessary precautions to prevent spillage.

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INTRODUCTION

Spillage of scoleces is a major problem in surgery of hydatid cysts, because each of them may develop into a new cyst if they settle on a suitable area such as the peritoneum.¹⁻⁴ Many surgeons believe if the contents of the cyst are bilious, spillage of scoleces is not hazardous, because bile kills the scoleces. This subject has not been proven in any study. The following prospective study was conducted in order to evaluate the effect of bile on scoleces and prove or disprove the above idea.

MATERIAL AND METHODS

This study was designed to be performed in 3 sections:

1. Assessment of viability of scoleces in the bilious contents of ruptured hydatid cysts of the liver. In those patients which laparotomy had been performed for hydatid cyst of the liver and at operation, it was recognized that the cyst had ruptured and its contents were bilious the contents were collected and viability signs of scoleces, including amebic motility, complete wall, movement of hooklets and cytoplasmic granules were searched for under the microscope.

In this part, the contents of 8 ruptured cysts were assessed.

2. The contents of intact hydatid cysts of sheep livers, obtained from Shiraz slaughter-houses, were aspirated and the viability of scoleces was assessed using the procedure used in section one. The fluid containing live scoleces was divided into 0.5, 1, 2, 5 and 10 cc volumes, and 2 cc in another tube was used as control. One ml of bile which was collected from gallbladders of patients who had cholecystectomy because of biliary colic was added to the tubes of the study group. After 30 seconds, 1, 2, 5, 20, and 30 minutes and 1, 12, 24 and 48 hours, we assessed the viability of scoleces under the microscope. The tubes were kept at 37°C temperature in an incubator during the experimental period. In this section, we studied the contents of 5 cysts in 25 laboratory tubes.

3. In patients who underwent operation for hydatid cyst of the liver, the contents of the cysts were aspirated before injecting any scolecidal agent. The viability of scoleces was assessed. If scoleces were viable, the study was performed following the procedure described in section two. The contents were assessed in 45 tubes. In both sections 2 and 3, we had samples as the control group.

RESULTS

In section 1, all scoleces in 6 hydatid cysts were dead

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Table I. Comparison of scoleces' status in control and study groups throughout the experiment.

Time after beginning the study	Study group	Control group
30 seconds	Most of them alive with normal activity	most of them alive with normal activity
1 minute	No significant change	No significant change
2 minutes	No change	No change
5 minutes	Increase in cytoplasmic and hooklet movement	No change
10 minutes	Increase in cytoplasmic and hooklet movement and appearance of pseudopods	No change
20 minutes	Like previous stage, edematous scoleces	No change
1 h	Like in 20 minutes, no increase in no. of dead scoleces	No change
2 h	Decrease in cytoplasmic and hooklet movement and their size	No change
12 h	Mild cytoplasmic movement, hooklets fallen off, but cytoplasmic wall is intact in most scoleces	Some hooklets have fallen off and some cytoplasmic walls have ruptured, but no significant change in the no. of dead scoleces
24 h	Hooklets have fallen off or the cytoplasmic wall has ruptured in most, but live scoleces are significant yet	The number of dead scoleces has increased
48 h	All scoleces are dead	All scoleces are dead

and about 10% of scoleces in the other 2 cysts were alive. In section 2 and 3, in the study group, there was no change in 5 minutes, but after this time, their movements increased such that after 20 minutes from the beginning of the test, cytoplasmic movement was significant. The scoleces developed pseudopods and their shapes changed from round to elliptical and vice-versa. At this time, the movement of hooklets increased. The size of scoleces also increased (became edematous). After one hour, all scoleces had very significant movements with no dead scoleces in the field.

Two hours after the beginning of the test, cytoplasmic movement and the size of scoleces decreased. Few scoleces had amebic movements and pseudopods. The hooklets of some scoleces had fallen but their walls were intact.

Scoleces had sluggish movements 24 hours after the beginning of the test, most of them had no hooklets, and the cytoplasmic wall was ruptured in some. Up to 24 hours after initiating the test, there was no change in the status of scoleces in the control group, but dead scoleces appeared in the field afterwards. 48 hours after the start of the test, all

scolecies in the study group and most of the scolecies in the control group had ruptured walls and had no hooklets. The cytoplasm of scolecies in the control group was colorless and shining but that of the study group was yellowish (Table I).

DISCUSSION

The results of this study revealed that the movements of the scolecies in the study group increased significantly 20-60 minutes after initiating the test. After this period of time, movements decreased gradually in the study group and after 48 hours, there were no live scolecies in the control or study groups.

According to these findings, it would be rational to conclude that bile is not scolecicidal per se, and environmental changes such as pH, presence of bile salts and nutrition of scolecies are the factors which make life for scolecies impossible. In this situation, the scolex, like other living organisms, does its best to escape from such environments. As it was visible, movements of scolecies were excessive 20-60 minutes after the beginning of the test. This activity could last for a limited time. The organism must either leave the environment or adapt to it.

Comparing the study group with the control group, it is obvious that the scolecies of the control group would not have any change in movements and structure in this period of time. After 24 hours, movement in the study group de-

creased but at a rate similar to that of the control group. The number of dead scolecies was approximately equal in both groups at this time.

It is concluded that bile per se is not scolecicidal, but scolecies will die because of the unfavorable environment. If bile enters the hydatid cyst of the liver, it is not the bile which kills the scolecies. Those scolecies which enter the biliary tree will be washed out and those remaining in the cyst will die gradually due to the unfavorable environment. Considering this fact the scolecies in a ruptured cyst of the liver may be alive and able to develop new cysts.¹ Thus the surgeon should be aware of this and observe all necessary precautions to prevent spillage.¹⁻⁴

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Figure 1: A schematic diagram of a neural network architecture. It shows an input layer with 4 nodes, a hidden layer with 5 nodes, and an output layer with 2 nodes. The nodes are connected by lines representing weights. The input nodes are labeled 'x1', 'x2', 'x3', and 'x4'. The hidden nodes are labeled 'h1', 'h2', 'h3', 'h4', and 'h5'. The output nodes are labeled 'y1' and 'y2'. The connections between the input and hidden layers, and between the hidden and output layers, are shown with arrows indicating the direction of information flow.