GALL BLADDER FUNCTION IN SALMONELLA CARRIERS

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Disturbances in the concentration and motor functions of the gall bladder were found by excretory and concentration cholecystography in dogs after injection of a suspension of Salmonella typhimurium into the gall bladder.

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No attempt has been made to study gall bladder function in salmonella carriers, yet the problem is of definite interest for a correct understanding of the pathogenesis of the carrier state in connection with this species of bacteria and also for the development of rational treatment and assessment of its value.

In this paper we described the results of 132 investigations performed on mongrel dogs.

EXPERIMENTAL METHOD

To study gall bladder function, a radiologic method was used. Investigation of the infected animals was preceded by the study of gall bladder function in 33 dogs under normal conditions (experiments of series I). Filling of the bile ducts and the concentration function of the gall bladder were studied by excretory cholecystography. For analysis of the cholecystograms, our suggested method of quantitative evaluation of roentgenologic findings, which facilitates the early diagnosis of disturbances of gall bladder function, was used.

EXPERIMENTAL RESULTS

The normal concentration function of the gall bladder takes place in a regular succession of phases. Ten minutes after intravenous injection of the contrast medium, radioopaque bile entered the gall bladder. After 35 ± 11 min, the gall bladder was outlined, and after 60 ± 7 min, radioopaque bile was present in the fundus of the gall bladder. The volume of radioopaque bile in the fundus increased uniformly by 4.2% in a period of 15 min. The volume of inflowing bile increased by 4.6% during intervals of 15 min for 60 min, and thereafter remained unchanged. By 149 ± 15 min after intravenous injection of contrast medium the shadow of the gall bladder became homogeneous. In the phase of digestion, the contents of the gall bladder entered the intestine. Under normal conditions in dogs, after a meal of 10 ml yolk, the empty phase lasted for 68 ± 11 min. During this time the volume of the gall bladder diminished by 57%.

Having established the pattern of the principal functions of the gall bladder under normal conditions, the next step was to study these functions under pathological conditions. In the experiments of series II, the gall bladder function was studied in 20 dogs which were carriers of Salmonella typhimurium. The dogs were investigated 6-7 months after infection. The gall bladder was infected by injecting 8-10 billion S. typhimurium cells into the organ at laparotomy. Seven dogs, undergoing the operation without the infection, served as controls.

In five of the controls and seven of the infected animals the concentration function of the gall bladder was normal. Disturbances of this function were found in 65% of cases. Depending on the severity of the changes, five grades were distinguished. In grade I the changes consisted of an increase in the concentration function. The volume of radioopaque bile in the fundus increased by 6.15% during 15-min intervals. The volume of nonopaque bile also diminished more intensively than normally. In grade II, the concentration function of the gall bladder was reduced, as shown by the later appearance of outlining of the gall bladder, and of the layer of radioopaque bile in the fundus, than under normal conditions. The volume of radioopaque

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bile in the fundus increased only 67% as quickly as under normal conditions, increasing by only 2.8% during 15-min intervals.

Diagnosis of early disturbance (grades I-II) of the concentration function of the gall bladder was made entirely by quantitative analysis of the cholecystogram. In grade III disturbances, the shadow of the gall bladder outline and the appearance of the three layers were absent, and the gall bladder shadow was homogeneous because of intensification of its distal half. In grade IV, the gall bladder shadow became homogeneous at once, and in grade V filling of the gall bladder took place from the fundus. The absence of a regular succession of phases in the course of filling the gall bladder when marked disturbances of the concentration function (grades III-V) were present was due to rapid diffusion of the incoming contrast medium and of the bile in the gall bladder because of the slight difference in their specific gravity. The disturbances of movements of the gall bladder consisted of weakening of its contractions and less complete emptying than under normal conditions, leading to stasis of the bile.

Comparison of the roentgenologic and histological findings showed that the changes in gall bladder function are evidence of morphological changes in its walls.