LIVER DEGLYCOGENATION AFTER PORTACAVAL TRANSPOSITION

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As part of an overall investigation of the metabolic effects of portacaval transposition, liver glycogen levels in dogs were studied before and after this surgical procedure. Silen and associates studied total liver glycogen with a histochemical technique in dogs subjected to portacaval transposition and later killed. Glycogen levels were reported to be normal, but no attempt was described to stop enzymatic deglycogenation from the time of death until the tissue was fixed. Since trichloracetic acid (TCA) soluble glycogen is extremely labile, the tissue must be frozen immediately upon biopsy to prevent a loss of this fraction of the glycogen.

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METHOD

In the present study 17 adult mongrel dogs of mixed sex ranging in weight from 11.7 to 22.7 kg. were fasted for 20 hr. and subjected to portacaval transposition. Immediately before the anastomoses a 1 gm. sample of tissue from the anterior margin of the liver was removed and frozen between blocks of dry ice. Hypothermia was utilized during surgery to protect the bowel from the effects of acute portal obstruction. In 13 of the dogs all tributaries of the inferior vena cava from the inguinal ligaments to the liver, with the exception of the renal veins and their tributaries, were ligated and divided. In the remaining 4 dogs the inferior vena cava branches were not disturbed. Following surgery the dogs were returned to a normal kennel routine. Four to 6 weeks later the dogs were fasted for 20 hr. and a second 1 gm. sample of liver tissue removed at open biopsy and immediately frozen. The TCA soluble and TCA insoluble fractions of the liver glycogen were subsequently determined by the anthrone method of Seifter et al. (1).

RESULTS

Mean total glycogen in the 17 dogs decreased from 31.3 to 15.2 mg./gm. wet liver following portacaval transposition. When this 51% decrease was subjected to a "t" test it proved to be significant at the $p < 0.02$ level. Almost all the decrease in the total glycogen level was a reflection of changes in the TCA soluble glycogen fraction. The TCA soluble fraction decreased by 70% from a level of 21.5 to 6.4 mg./gm. wet liver. This decrease was highly significant ($p < 0.01$). The TCA insoluble or stabile glycogen showed only a slight decrease following portacaval transposition. This decrease from 9.9 to 8.8 mg./gm. wet liver amounted to an 11% change and was not significant. Differences were not observed in either fraction of the liver glycogen between animals with stripped or unstripped vena cavas.

DISCUSSION

The mechanisms involved in liver glyogen depletion following portacaval transposition remain unknown at present but laboratory results prompted the clinical use of the operative technique in 1 case of glycogen storage disease.

An 8 year old patient was proven, by analysis of a liver biopsy specimen, to have deficiency of the enzyme amylo-1-6-glucosidase. She had a massive, enlarged liver, and symptoms of episodic hypoglycemia. The lowest blood sugar obtained after overnight fasting was 55 mg./100 ml. A portacaval transposition was performed, and she was discharged from the hospital 9 days later. Three months later, the hepatomegaly had regressed so that the liver was only slightly en-

larged. Growth and sexual maturation had accelerated. There had been no hypoglycemic episodes since the time of operation, and the frequent between meal feedings of sugar with which she had been treated for most of her life have been discontinued. The lowst post-operative fasting blood sugar was 64 mg./100 ml. Patency of the porta caval anastomosis was proved with venograms. Liver function was normal except for low cholesteral esters. Clinically, she appears to have benefited from this operation.

REFERENCE

1. SEIFTER, S., DAYTON, S., NOVIC, B., and MUNTWYLER, E. The estimation of glycogen with the anthrone reagent. Arch. Biochem., 1950, 25:191–200.