tively low resistance of skin for high frequency as compared to the immense resistance toward DC; and the fact also that no difference occurs in case of HF for dry and moistened skin. The resistance of bone depends very pronouncedly upon the specimens observed; it was comparatively small for the porous bone of the skull (calvarium); it was very high for the solid bone of the tibia.

Conclusions: (1) The study of electrical resistance should be made with live material because pronounced changes occur in dead tissue. (2) The tissues vary so much as to resistance that the course of the electric current is affected and a great variation of heat production should be expected. This is important for the placing of electrodes. (3) Skin resistance is much greater than the resistance of the average tissue for DC; it is a little greater for HF. Therefore direct current seems more useful for skin cautery while high frequency is less irritative to the skin and more useful for deep therapy.

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The Electrocardiogram in Experimental Obstructive Jaundice.*

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In a previous communication[1] it was noted that there is an age factor in the production of bradycardia in dogs following ligation and division of common bile duct. A slowing of the heart action was observed only in the puppy; in the adult animal a slight acceleration of the heart rate was the rule. The heart rate was determined by ausculation supplemented, in the puppy, by the electrocardiogram. The present investigation purposed to note whether the heart rate of the adult animal as determined by the latter method was in agreement with ausculatory findings, and also to elucidate electrocardiographic abnormalities.

This report is based upon a study of the curves obtained from 13 of 21 animals subjected to ligation and division of the common bile duct. Eight animals revealed extensive biliary or other infection at autopsy; the data that these furnished were derived from the control

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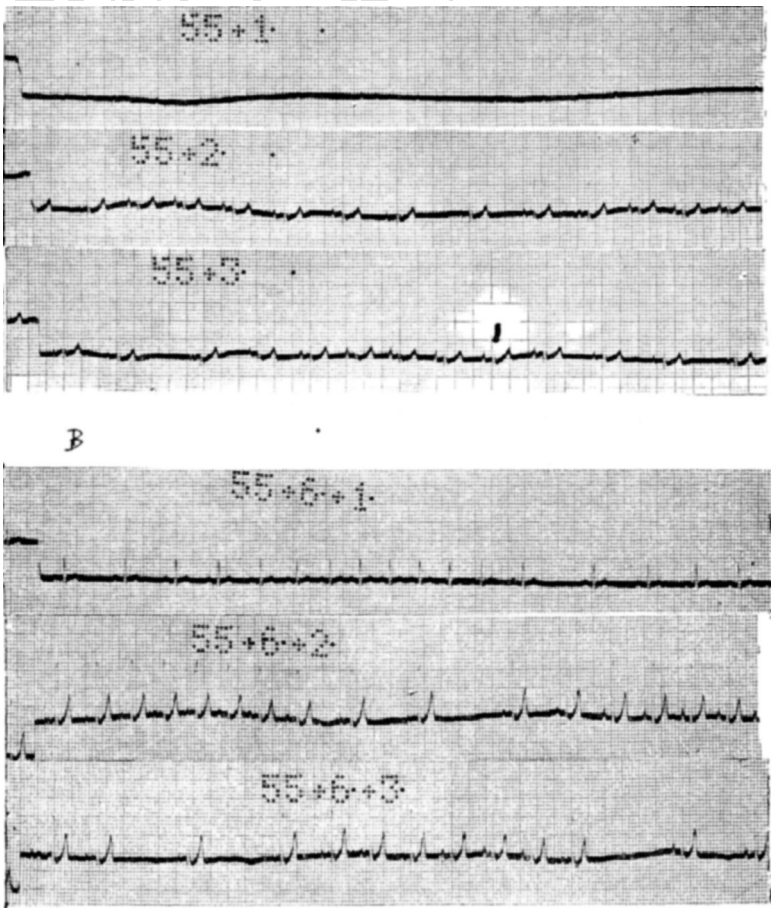
[1] Buchbinder, William C., *Arch. Int. Med.*, 1928, xlii, 743.

curves. Electrocardiograms were made at 3 to 4 day intervals before and after the induction of jaundice, the animal lying quietly on its right side.

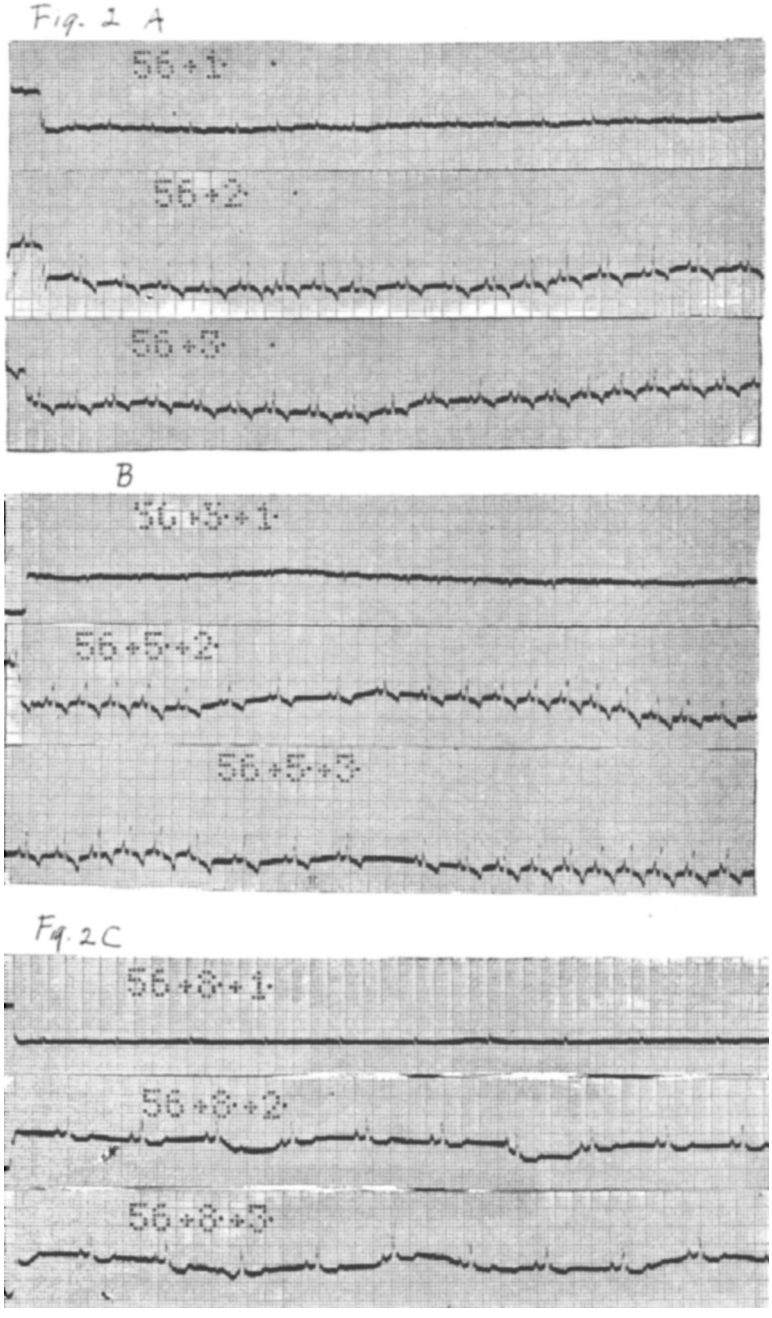
The essential change noted in the electrocardiogram following ligation and division of the common bile duct was an accentuation of the breathing arrythmia, normally present in a dog. This was seen in the curves of 9 of the 13 animals (Figs. 1B and 2B). A slight in-

Fig. 1 A



A. Control curve. Rate approximately 105. B. 8 days after ligation and division of the common bile duct. There is a marked accentuation of sinus arrythmia. The increase of the R-R interval might conceivably be interpreted as being due to sinus block. **Rate approximately 115.** There is an increase in the voltage of R and T, especially the latter.

NOTE: In these and the following records the ordinates are 0.04 of a second apart; the abscissae 10^{-4} volts. Standardization was such that 1 cm. equals 1 millivolt.



A. Control curve. Rate approximately 125. There is some slurring of the QRS group. B. 5 days after ligation and division of the common bile duct. Marked accentuation of sinus arrythmia. Rate approximately 135. P and R are inverted in the first lead as the result of a slight shift of the anatomic axis of the heart. C. 15 days after ligation and division of the common bile duct. Animal moribund. Sinus slowing. Rate 75. There is a marked splitting of the P and R waves.

crease in the heart rate usually occurred during the inspiratory phase; at the end of expiration there was a prolongation, relative or absolute, of the R-R interval. The two phases of respiration therefore became more sharply demarcated from one another. As a result the heart tended to be slightly more rapid than before the induction of jaundice, thus confirming the findings obtained by auscultation. A more marked tachycardia occurred in the curves of 4 animals, sinus arrythmia here almost disappearing. A marked sinus bradycardia was seen in the electrocardiogram of only 1 animal, but only after it became moribund.

Excluding the records of several animals in this state or at the point of exitus (Fig. 2-C), the electrocardiogram showed no significant departure from the normal after the induction of jaundice. There was no increase in the conduction time of the heart. The voltage of R and T remained unchanged except in 2 curves late in obstruction when they were concomitantly increased. Slight changes in the amplitude of R in the first and third leads frequently seen in the dog, purely respiratory effects, became a little more conspicuous with the accentuated sinus arrythmia. An extrasystolic arrythmia was not seen in any of the electrocardiograms. Inversion of the p wave was encountered twice; it was transient and in one instance could be accounted for by a shift of the anatomic axis of the heart, due, probably to fluid accumulation into the peritoneum.

A directional change of the T wave after the induction of jaundice could not be determined after a study of the curves. Since this wave is notably unstable in the dog the evaluation of any morbid process as affecting a change in its direction becomes increasingly difficult. Thus the control electrocardiograms of only 7 of the 21 animals showed T waves having a uniform direction, those of 2 displaying always an upright, and of 4 always a downward deflection in all leads. The incidence of negative and positive deflections from a total of 63 control curves derived from the 21 animals was as follows: In the first lead there were 24 positive and an equal number of negative deflections. In the second and third leads 23 negative as opposed to 28 positive deflections. Sixteen consecutive tracings of one animal subjected to a mock operation after the usual 3 were obtained, revealed a similar lack of uniformity in the direction of the T wave. This inherent instability of the T wave would have manifested itself, in all probability, in all instances had sufficient curves been made of those in which it appeared stable. From these data it would be hazardous to conclude that jaundice influences its direction. On the other hand a parallelism in the change of its direc-

tion in the second and third leads throughout the period of obstruction is strong argument against any directional change of the T wave in jaundice.

Summary: An accentuation of sinus arrythmia constitutes the essential change in the electrocardiogram of adult dogs subjected to ligation and division of the common bile duct. A slight increase in the heart rate occurs in the jaundiced adult dog. Obstructive jaundice in this animal does not appear to produce any directional change of the T wave.