

CHANGES IN THE PHONOCARDIOGRAM AND STRUCTURE  
OF THE CARDIAC CYCLE IN DOGS WITH  
STREPTOCOCCAL TONSILLITIS

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In experimental tonsillitis caused by injection of a culture of a virulent strain of  $\beta$ -hemolytic streptococcus into the tonsillar tissue of dogs, changes were found in the phonocardiogram (appearance of a systolic murmur, decrease in amplitude and increase in duration of the heart sounds) and in the duration of phases of the cardiac cycle (of the periods of transformation, contraction, and expulsion).

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The object of this investigation was to produce streptococcal tonsillitis in dogs and to study changes in the cardiovascular system in this experimental disease.

### EXPERIMENTAL METHOD

Tonsillitis was produced by injecting 0.2 ml of an emulsion (1:1) of a broth culture of a virulent strain of  $\beta$ -hemolytic streptococcus in Freund's adjuvant into the tonsillar tissue of dogs. Clinical manifestations of inflammation of the tonsils appeared on the 2nd-3rd day after infection and persisted for 1.5-2 months.

The dynamics of the phonocardiogram (PCG) (recorded in 4 frequency bands) were studied by the method usually adopted in clinical research, and the phonocardiograph was located at Botkin's point. The phases of the cardiac cycle were investigated by a polycardiographic method [2-6]. Experiments were performed on 11 dogs.

### EXPERIMENTAL RESULTS

In ten dogs a systolic murmur was found at various times after production of experimental tonsillitis. As a rule the murmur was of low amplitude and average frequency, inconstant and short in duration, occupying from half to two-thirds of systole, and merged with the 1st heart sound or began a short interval after the 1st sound. The character of the murmur indicated that it was functional; at autopsy no morphological changes were found in the heart valves.

Several other changes in the PCG also were observed, notably a decrease in the amplitude of the heart sounds and an increase in their duration. In experimental streptococcal tonsillitis a sharp decrease in amplitude of the high-frequency component of the heart sound was observed. No marked reduplication of the heart sounds was found, but a slight increase in their duration was a frequent observation.

The initial indices of the phase structure of the cardiac cycle were essentially indistinguishable from those given in the literature [2, 3]: the period of contraction  $0.094 \pm 0.005$  ( $M \pm m$ ) sec; period of expulsion  $0.214 \pm 0.003$  sec; phase of transformation  $0.49 \pm 0.002$  sec; phase of increase in pressure  $0.045 \pm 0.004$  sec; Blumberger's coefficient  $2.3 \pm 0.15$ .

Besides these indices of phases of the cardiac cycle, their intrasystolic indices ( $\Pi$ ) were calculated (expressed as the ratio between the duration of the corresponding phase and the duration of mechanical systole, in percent) [1-3]. The initial value of  $\Pi$  of the contraction period ( $M \pm m$ ) was  $30.1 \pm 1.1$ ,  $\Pi$  for the period of expulsion was  $69.9 \pm 1.1$ ,  $\Pi$  for the phase of transformation  $15.7 \pm 0.5$ , and  $\Pi$  for the phase of increase in pressure  $14.4 \pm 0.9\%$ .

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Significant changes in the phase structure of the cardiac cycle were found in experimental tonsillitis lasting 1-1.5 months, and to a lesser degree in its acute phase. For example,  $\Pi$  for the contraction period increased on the average by 3.9% ( $P < 0.01$ ) after 4-6 weeks of tonsillitis,  $\Pi$  for the expulsion period at the same time was reduced by 4.4% ( $P < 0.01$ ), and Blumberger's coefficient was reduced by  $0.4 \pm 0.08$  ( $P < 0.01$ ).

$\Pi$  for the transformation phase was significantly increased in all stages of experimental tonsillitis, the mean value of this increase in the acute stage (until 7 days after infection) being 4.8% ( $P < 0.02$ ), in the first two weeks 3.3% ( $P < 0.01$ ), after 1-1.5 months 2.9% ( $P < 0.01$ ), and after 2.5-3 months 1.8% ( $P < 0.05$ ).

No significant changes could be found in the value of  $\Pi$  for the phase of increase in pressure in the animals with experimental tonsillitis.

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