

ELECTROCARDIOGRAM ALTERATIONS IN PERICARDITIS IN CHILDREN *

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Of 128, 492 patients examined in our clinic between the years 1958 and 1961, 10,651 were admitted to the hospital for electrocardiographic examination. Thirty - seven of these were considered to be possible pericarditis cases. After further examination and a review of the electrocardiograms, three patients were found to have myocarditis, one electrolyte defect, and one had edema. The remaining 32 cases were definitely pericarditis. An average of eight cases per year is consistent with the figures reported by Toronto Children's Hospital in Canada, where there were 325 cases of pericarditis in a 30 year period.

A comparison of the number of patients examined in our hospital and those admitted for treatment is presented in table 1.

TABLE 1
PERICARDITIS CASES (1958 to 1961)
AT HACETTEPE CHILDREN'S HOSPITAL

Years	Number of Patients	Number Hospitalized	Patients with Heart Trouble	Patients with Pericarditis
1958	20,097	1,822	—	4
1959	29,182	2,775	—	7
1960	39,162	3,754	618	8
1961	40,046	2,300	969	13
Totals	128,492	10,651	—	32

We will present here five of our cases which we considered to be most typical, and a statistical analysis of the electrocardiographic alterations in our 32 patients.

Case Reports

Case 1: I. A., a seven year old girl, had acute rheumatism, which was not treated, two months before hospitalization. She was brought to the hospital with complaints of respiratory disorder and restlessness at night.

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Physical Examination : Weight : 19 Kg.; height, 109 cm.; temperature, 38.5 C.; pulse, 140 per minute; respiration, 49 per minute; blood pressure, 92/60 mm. Hg. There was purulent otitis media in the left ear. In the left subscapular area there was a respiratory murmur and Ewart's and Pin's signs were in evidence. Just left of the sternum, at the third intercostal space, there was some friction rub. The heart was enlarged, and there was systolic blowing of the first degree at all focuses in the precordial area. The heart sounds were distant. Other physical findings were within normal limits.

Laboratory Examination : Leucocyte count was 17,200; sedimentation rate was 59 mm. per hour; PPD was negative; streptococci were cultured from a throat smear.

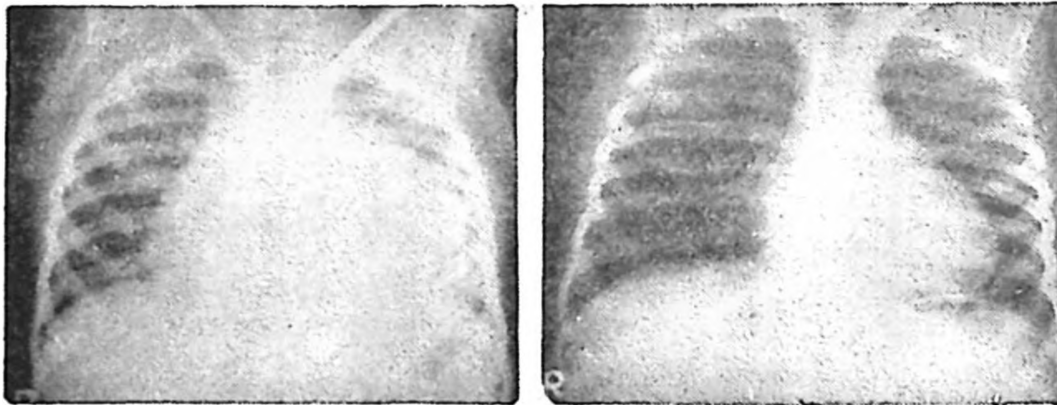


Figure 1. A and B

Teleroentgenography revealed a heart shadow characteristic of pericarditis (figures 1A and 1B). In the electrocardiogram (EKG) the voltage was low in the standard derivations, in D_2 , D_3 , and D_6 , the S-T segment was high and the T wave straightened in both standard and precordial derivations (fig. 2).

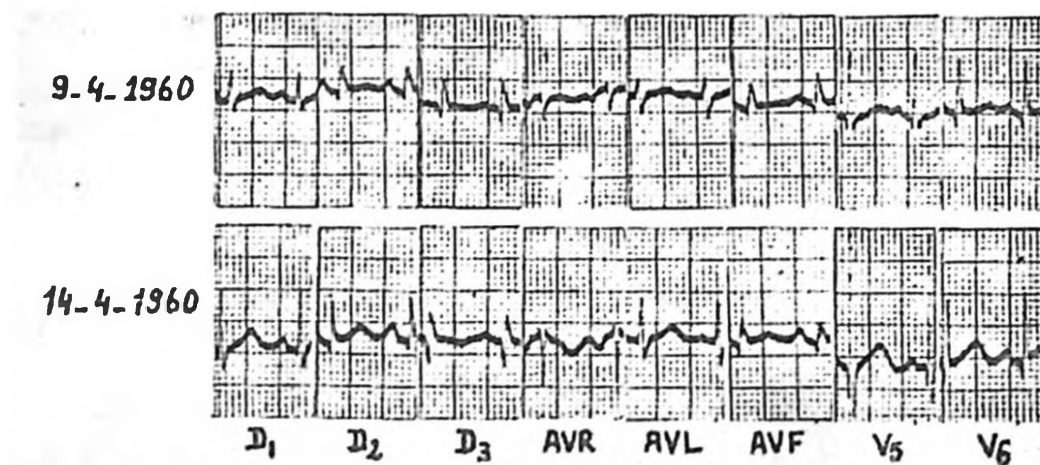


Figure 2.

This case was diagnosed as rheumatic pericarditis and treated with penicillin and cortisone. The heart returned to normal size in a short time (fig. 1B), and the EKG became normal (fig. 2, lower band). The sedimentation rate at this time was 5 mm. per hour.

Case 2: Y. E., a five year old boy, was admitted to the hospital with complaints of respiratory disorder which began 15 days prior to admission, and swelling of the feet which had lasted for three days. There was no history of rheumatism.

Physical Examination: Weight, 17 Kg.; temperature, 38.3 C.; pulse, 160 per minute; respiration, 60 per minute; blood pressure, 115/65 mm. Hg. The jugular vein was swollen and there were static rales in the bases of the lungs. The heart was found to be enlarged on percussion, the heart sounds were distant, but there was no friction rub. The liver could be felt at the midclavicular line, and six cm. below the right costal margin. There was pitting edema in the legs.

Laboratory Examination: The leucocyte count was 11,200; the sedimentation rate was 61 mm. per hour; antistreptolysin titration was 833; Todd's unity and PPD were negative.

Teleroentgenograms of the heart indicated that the heart was jar-shaped and there was stasis in the lungs (fig. 3). The EKG was typical of pericarditis (fig. 4).

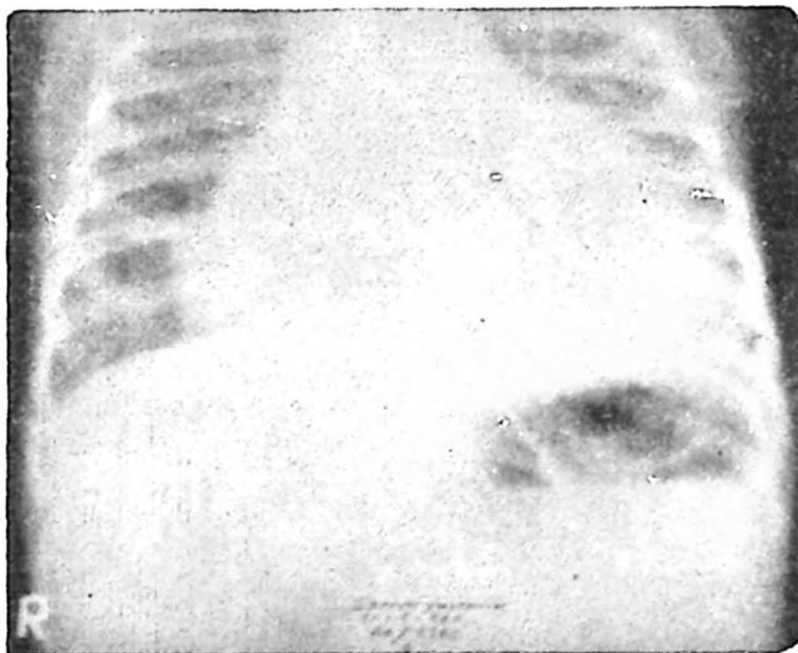


Figure 3.

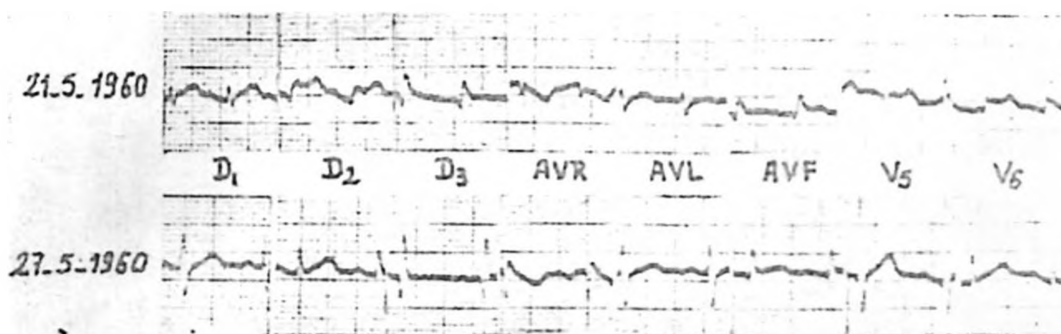


Figure 4.

The case was diagnosed as one of rheumatic pericarditis and treated accordingly. Within six days there was slight improvement, as seen in the EKG (fig. 4, lower band). The patient was taken from the hospital at this point and we have not been able to check his progress since then.

Case 3: P. S., an eight year old boy, was admitted to the hospital with complaints of pain and swelling in his left leg and swelling on the left side of the trunk.

Physical Examination: Weight, 22.2 Kg.; temperature, 38.0 C.; pulse, 128 per minute; respiration, 36 per minute; blood pressure, 90/58 mm. Hg. His complexion was pale and he had difficulty breathing except in the upright position. There was a chronic abscess, 24 square cm. in area, at the level of the third intercostal space near the armpit. There was some dullness on percussion at the base of the lungs, especially on the left. The heart was enlarged and there was some friction rub in the mesocardiac area. The liver was enlarged and extended three cm. below the right costal margin. The left leg and knee were edematous with several fistulas.

Laboratory Examination: The leucocyte count was 23,000; PPD was negative; pathogenic staphylococcus was cultured from material taken from an osteomyelitic scar, and from fluid removed from the pericardium. Roentgen ray examination revealed an enlarged and jar-shaped heart, with swelling of the soft tissues on the left (fig. 5A). The EKG was also typical of pericarditis (fig. 6).



Figure 5. A, B and C

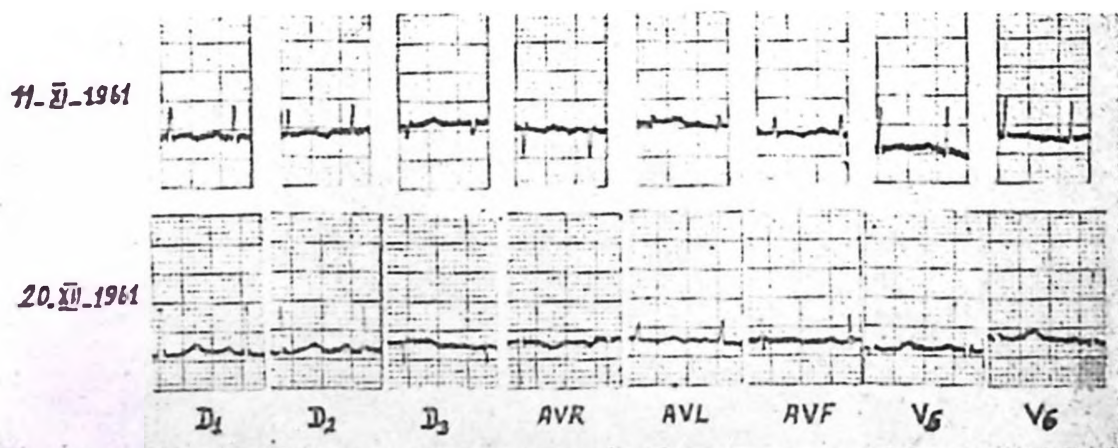


Figure 6.

The condition was diagnosed as septicemic osteomyelitis and pericarditis, and was treated with massive doses of penicillin, streptomycin and tetracycline. The pericardium was drained, under anesthesia, and 150 cc. of liquid were removed. Teleroentgen ray examination revealed some thickening of the pericardium (fig. 5B) and cortisone was added to the treatment. The left thigh was operated on and set in a splint. The patient's condition improved and on the 34th hospital day the teleroentgenogram was almost normal (fig. 5C). The EKG was also normal at this time (fig. 6, lower band). The patient was discharged 56 days after admission.

Case 4: K. S., a five year old girl, had fever and abdominal pains 18 days prior to admission to the hospital. Chief complaints at the time of admission were orthopnea, swelling of the body, flushing, and inability to lie down comfortably.

Physical Examination: Weight, 18.5 Kg.; height, 104 cm.; temperature, 38.2 C.; pulse, 128 per minute, respiration 52 per minute, blood pressure, 110/150 mm. Hg. The patient was cyanotic, dyspneic, orthopneic, and the jugular vein was prominent. On percussion, the heart dullness was increased. The heart sounds were distant. There were diffused crepitant rales with dullness on the posterior bases of both lungs. The liver could be felt at the midclavicular line and ten cm. beyond the costal margin. There was pitting edema of the legs.

Laboratory Examination: The leucocyte count was 27,000; PPD was negative; sedimentation rate was 10 mm. per hour. Staphylococci were cultured from material taken from the pericardium and throat. Both the teleroentgenogram and EKG were typical of pericarditis (figures 7A and 8).

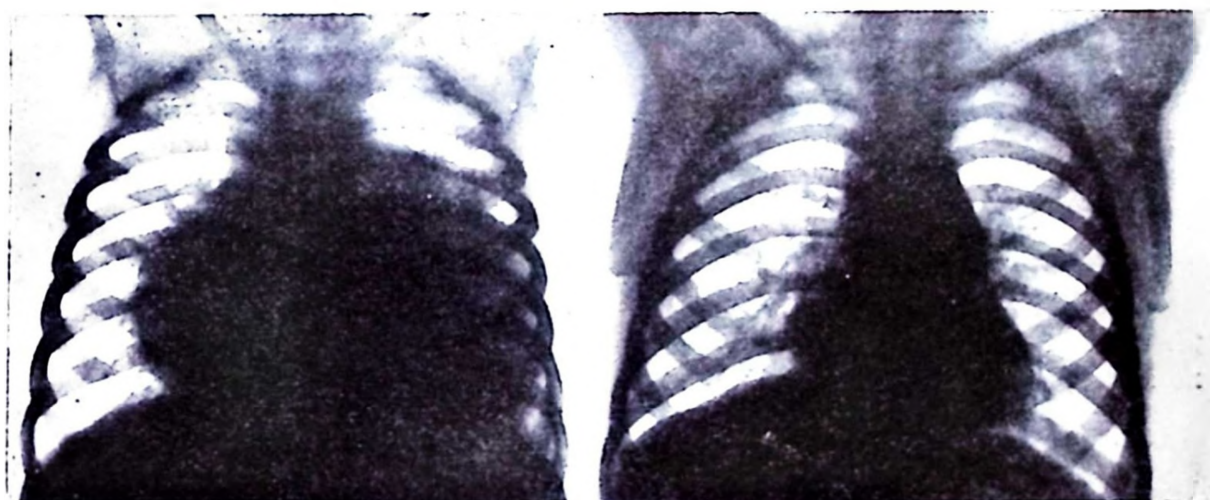


Figure 7. A and B

Massive doses of antibiotics were given, and the patient was digitalized. About 560 cc. of fluid were removed from the pericardium (several attempts were made to drain the pericardium) but the results were not satisfactory. There was evidence of frequent cardiac insufficiency, and the patient's condition was considered to be criti-

cal many times. A pericardotomy was performed in order to prevent the development of constrictive pericarditis. The patient improved gradually after the pericardotomy, the EKG became normal (fig. 8, second and third bands) and the patient was discharged but followed closely until complete recovery had been made (figures 7B and 8, fourth band).

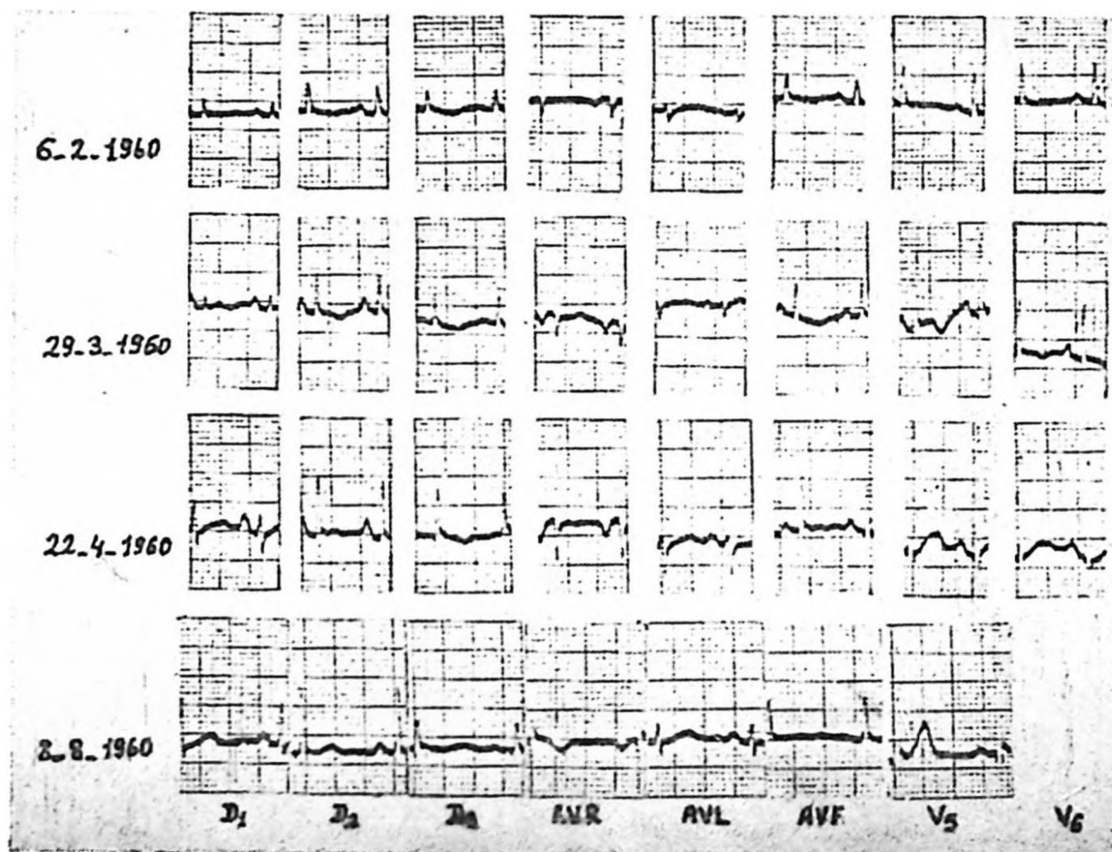


Figure 8.

Case 5: Y. O., an eight year old girl, was admitted to the hospital with complaints of fever, orthopnea and coughing, which had lasted for 15 days. There was no history of rheumatism.

Physical Examination: Weight, 24 Kg.; height, 120 cm.; temperature, 38.1 C.; pulse, 120 per minute; blood pressure, 110/60 mm. Hg. Her complexion was pale, heart beats were distant, and there was friction rub for a period of four days recorded in the mesocardial focus. The liver could be felt three to four cm. below the right costal margin in the midclavicular line.

Laboratory Examination: The leucocyte count was 11,300; sedimentation rate was 53 mm. per hour. The urine was normal and PPD was negative. Teleroentgen examination indicated that the heart was tent-shaped and there was liquid in both pleural cavities (fig. 9A). The EKG voltage was low and the T waves showed some straightening.



Figure 9. A and B.

The case was diagnosed as one of rheumatic pericarditis and pleuresy. The patient was treated with penicillin and cortisone and there was definite improvement within ten days. The sedimentation rate dropped to 15 mm. per hour, and the teleroentgenogram was normal (fig. 9B). She was discharged on the twelfth hospital day.

EKG Analysis of the Cases

We have studied the low voltage, S - T segment and T wave alterations in the EKG's of our 32 pericarditis cases, in standard unipolar, bipolar and precordial derivations. Low voltage seems to be characteristic of effusions in pericarditis and has no pathognomonic value by itself.

TABLE 2

LOW VOLTAGE IN EKG OF 32 PERICARDITIS CASES

Voltage	Standard Unipolar Derivations		Bipolar Derivations		Precordial Derivations			
					Right		Left	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Normal: higher than 10 mm.	9	28	9	28	28	88	18	56
Slight fall: 8-10 mm.	18	56	18	56	4	12	13	40
Deep fall: lower than 5 mm.	5	16	5	16	—	—	1	3

According to table 2, the voltages in approximately three-fourths of the standard derivations fall together and to the same degree. In the left precordial derivation, voltages fall in approximately half of the cases. In the right precordial derivation there is no immediate change.

Most S - T segment changes are seen in the acute phase of the disease. In the chronic phase or during recovery these defects gradually disappear. A rise in the S - T segment in all derivations in the acute phase is a characteristic of the disease and a valuable aid in diagnosis (table 3).

TABLE 3
S - T CHANGES IN 32 CASES OF PERICARDITIS

S - T Segment	Standard Unipolar Derivations		Bipolar Derivations		Precordial Derivations			
	No.	Per cent	No.	Per cent	Right		Left	
					No.	Per cent	No.	Per cent
Rising	18	56.2	16	50	1	3.1	10	31.2
Lowering	2	6.2	2	6.2	—	—	1	3.1
Lengthening	2	6.2	1	3.1	1	3.1	2	6.2
Normal	10	31.2	13	40.7	30	93.8	19	59.4

As seen in table 3, the S - T segment is almost normal in the right precordial derivations while in the others there is an increase of 31.2 to 56.2 per cent.

T wave alterations are generally observed to follow the acute phase of the disease. T wave changes, especially T negativity, are considered to be pathognomonic two or three weeks after the onset of the disease in children (table 4).

TABLE 4
T WAVE ALTERATIONS IN THE EKG OF 32 PERICARDITIS CASES

T Wave	Standard Unipolar Derivations		Bipolar Derivations		Precordial Derivations			
	No.	Per cent	No.	Per cent	Right		Left	
					No.	Per cent	No.	Per cent
Biphasic	5	15.6	2	6.2	7	21.8	2	6.2
Straightened	3	9.2	4	12.5	6	18.6	8	24.8
Negative	20	62.5	23	71.8	7	21.8	16	50.0
Normal	4	12.5	3	9.3	12	37.5	6	18.6

As can be seen in table 4, there is a T defect in the standard unipolar and bipolar derivations in 28 out of 32 cases. In the precordial derivations, however, there is a more pronounced defect on the left than on the right. The most common T wave defect is negativity, and it is, therefore, considered a valuable criterion in evaluating the EKG's of children with pericarditis.

Summary

The author presents five typical pericarditis cases, and an analysis of the electrocardiograms of 32 pericarditis patients treated at Hacettepe Children's Hospital between the years 1958 and 1961.

REFERENCES

1. Keith, J. D., Rowe, A. D., and Vlod, P.: Heart Disease in Infancy and Childhood, New York, Macmillan Company, 1958.