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ORIGINAL ARTICLE

Electrocardiographic Pattern of Typhoid Fever in Children

by

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Abstract

Of 87 children with typhoid fever, from age ranging in 2.5 to 14 years, 62.0% showed ECG changes. Sinus tachycardia and left ventricular hypertrophy were the two most frequent abnormalities.

The majority of ECG changes occurred in the first week of admission and return to normal two weeks thereafter. There were no significant differences in the frequency of abnormal ECG pattern by sex, age, and nutritional state.

Introduction

Nowadays in Indonesia typhoid fever (TF) is stiil common. Its endemicity is the result of inadequate water supply and poor hygiene. In 1985, TF ranked first of all disorders found at the Unit of Infectious Diseases, Department of Child Health, Ujung Pandang General Hospital (Sitepu et al., 1985). Cardiac abnormalities including ECG changes have been reported in infectious diseases. Rasyid et al. (1978) studied ECG pattern in children suffering from TF in Yogyakarta and found 76.3% with ECG abnormalities. Salaki et al. (1985) reported an incidence of 73.7%.

The aim of this study is to investigate the ECG pattern of TF in children.

Materials and Methods

All children with suspected TF at the Department of Child Health Ujung Pandang General Hospital Between April 1, 1986 and March 31, 1987 were included in this study. Patients with either congenital or acquired heart disease were excluded from the study. Both congenital and acquired heart disease were diagnosed based on history of illness, physical and radiological findings, and ECG pattern (Guntheroth, 1978).

The following data was recorded: age, sex, body weight and body length. The nutritional state of the patients was determined using the parameter of body weight (BW) to body length (BL) (Staff Bidang Sosio-Ekonomik Gizi dan Statistik Direktorat Gizi Departemen Kesehatan R.I., 1978):

BW 90% of standard BW was stated as wellnourished

BW 80.1 — 90% of standard BW was identified as undernourished

BW 80% of standard BW was defined as malnourished

The criteria for the diagnosis of TF were (Haeruddin and Makaliwy, 1986): (1) Unexplained continuous fever lasting seven days or more without response to antipyretics, loss of appetite and constipation. (2) Disturbance of consciousness, dry hair and skin, coated tongue. (3) Positive blood culture for Salmonella typhi and/or Widal titre by tube for 0 antigen of 1/320 or more, or an increase of titre during the clinical course. (4) temperature drops to normal 4–5 days after chloramphenicol therapy.

The diagnosis of TF was established based on the first two items with the presence of factor 3 or 4 or both.

Electrocardiographic tracings were done three times during hospitalization, starting at the time when TF was suspected, and repeated weekly thereafter. The ECG pattern found was interpreted as follows: (1) Normal: when rhythm, heart electrical axis, P wave, PR interval, QRS-complex, V_1, V_6, ST segment and T wave were within normal limits (Meurs and Arntzenius, 1981). (2) Becomes normal: when previous abnormal ECG pattern was found. (3) Persistent: when ECG tracing did not show any changes. (4) Variation: when there was a change but ECG remains abnormal.

Results

Of 87 patients studied, 43 were boys and 44 were girls, ranging in age from 2.5 to 14 years. Duration of fever prior to admission was between 7 and 14 days. Of all ECG tracings, 54 (62.07%) patients showed ECG changes (Table 1).

Table 1 : *Prevalence of ECG changes in children with TF*

ECG tracing	No. of TF cases with ECG changes
First	51 (58.62%)
Second	2 (2.30%)
Third	1 (1.15%)
Total	54 (62.07%)

Table 1 illustrats that the majority of ECG abnormalities (58.62%) occurred in the first tracing.

Table 2 : *ECG pattern and sex*

Sex	Abnormal ECG	Normal ECG	N
Boys	25 (58.14%)	18 (41.86%)	43 (100%)
Girls	29 (65.90%)	15 (34.10%)	44 (100%)
Total	54 (62.07%)	33 (37.93%)	87 (100%)

X^2 (1 df) = 0.5861 $p > 0.05$

There are no statistically significant differences in the prevalence of ECG changes between boys and girls.

Table 3 : *ECG pattern and age*

Age (years)	Abnormal ECG	Normal ECG	N
5	2 (40.00%)	3 (60.00%)	5 (100%)
5 - 10	38 (71.70%)	15 (28.30%)	53 (100%)
10	14 (48.28%)	15 (51.72%)	29 (100%)
T o t a l	54 (62.07%)	33 (37.93%)	87 (100%)

X^2 c (2 df) = 5,4640 p > 0.05

There are no statistically significant differences in the prevalence of ECG abnormalities among various age groups.

Table 4 : *ECG pattern and nutritional state*

Nutritional state	Abnormal ECG	Normal ECG	N
Wellnourished	20 (58.82%)	14 (41.18%)	34 (100%)
Undernourished	27 (64.29%)	15 (35,71%)	42 (100%)
Malnourished	7 (63.64%)	4 (36.36%)	11 (100%)
T o t a l	54 (62.07%)	33 (37.93%)	87 (100%)

X^2_c(2 df) = 0.2510 p > 0.05

Table 4 shows no statistically significant differences in the prevalence of abnormal ECG pattern among various nutritional states.

Table 5 : *Follow-up 51 cases with abnormal ECG I*

Abnormal ECG I	ECG II	ECG III
Become normal	19 (37.26%)	42 (82.35%)
Persistent	28 (54.90%)	7 (13.73%)
Variation	4 (7.84%)	2 (3.92%)
T o t a l	51 (100%)	51 (100%)

Table 5 demonstrates that the majority of abnormal electrocardiograms return to normal after two weeks.

Table 6 : *Follow-up of various ECG abnormalities*

ECG abnormalities	ECG I	ECG II	ECG III
1. Sinus tachycardia	38 (53.52%)	21 (29.57%)	7 (9.86%)
2. L V H	21 (29.57%)	12 (16.90%)	5 (7.04%)
3. Prolonged PR interval	4 (5.63%)	3 (4.26%)	—
4. Prolonged QT interval	3 (4.23%)	1 (1.26%)	—
5. L A E	3 (4.23%)	—	—
6. R B B B	2 (2.82%)	2 (2.82%)	—
T o t a l	71	39	12

Abbreviation :
LVH : Left ventricular hypertrophy
LAE : Left atrial enlargement
RBBB : Right bundle branch block

Table 6 shows that sinus tachycardia (53.52%) and left ventricular hyperthrophy (29.57%) are the two most frequently listed abnormalities. The third ECG tracings return to normal limits in most cases.

Discussion

Cardiac involvement in infectious diseases consists of either electrocardiographic changes which are usually non-specific and transient, or relatively mild and non-specific myocardial lesions as seen in fatal cases. These ECG abnormalities are probably caused by several factors, such as electrolyte imbalance especially potassium, autonomic nerves system, microorganisms, toxic or metabolic disturbances, or embolic vascular occlusions produced by the infection itself. The ECG changes may occur in the acute stage as well as during convalescence. They usually appear in the third of fourth week of illness and return to normal one to three weeks after the onset of convalescence (Friedberg, 1960). The most common changes are flat, diphasic or inverted T wave in two or more leads. A prolongation of PR interval especially during convalescence has been reported by some authors. Complete heart block has been found occasionally.

Relative bradycardia is characteristic of the febrile stage. True bradycardia and sinus arhythmia are common during convalescence. Tachycardia may appear in the third to fifth week of illness, as an evidence

of myocarditis, effort syndrome or complications such as intestinal haemorrhage or perforation (Freidberg, 1960).

In this study, of 87 children with TF, 62.07% had ECG changes. The ECG abnormalities are sinus tachycardia (53.52%), LVH (29.57%), prolonged PR interval (5.63%), prolonged QT interval (4.23%), LAE (4.23%), and RBBB (2.82%). Flat, diphasic or inverted T wave were not found.

Salaki et al. (1985) in Yogyakarta noted 73.7% of children with TF showed ECG abnormalities including sinus tachycardia (36.84%), arhythmia (2.63%) and supraventricular tachycardia (2.63%).

Consistent with Salaki's report, sex, age and nutritional state did not influence the frequency of ECG changes in TF.

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REFERENCES

1. FRIEDBERG, C.K.: Disease of heart. 2nd ed. pp 906-912 (Saunders, Philadelphia, London 1960).
2. GUNTHEROTH, W.G.: Initial evaluation of the child for heart disease. Pediatr. Clin. North. Am. 25 : 657-675 (1978).
3. HAERUDDIN PAGARRA.; MAKALIWY, Ch.: Demam tifoid pada anak. LIKA FK-UNHAS 3 : 17-23 (1986).
4. MEURS, A.A.H.; ARNTZENIUS; A.C.: Praktische electrocardiografie, pp. 10-12 (Scheltema & Holkema, Utrecht, Antwerpen, Bohn 1981).
5. RASYID, H.M.; ROSYID, R.; UNTORO; WAHAB, A.S.; ISMANGOEN : Kelainan Elektrokardiografi pada tifus abdominalis. Naskah diajukan dalam KONIKA IV, Yogyakarta, 1978.
6. SALAKI, A.; WAHAB, A.S.; DAMANIK; SUGENG, B.: Electrocardiographic pattern in children suffering from typhoid fever. Paediatr. Indones. 25 : 131-135 (1985).
7. SITEPU, F.; PALADA, P.; LISAL, J.S.: Morbiditas dan mortalitas di Bagian Anak RSU Dadi Ujung Pandang 1984. LIKA FK-UNHAS 3 : 48-68 (1985).
8. Staf Bidang Sosio-Ekonometrik Gizi dan Statistik Direktorat Gizi Departemen Kesehatan RI.: Pedoman Ringkas Cara Pengukuran Anthropometri dan Penentuan Keadaan Gizi. Pusat Penelitian dan Pengembangan Gizi. Badan Penelitian dan Pengembangan Kesehatan Dep-Kes R.I. (Bogor, 1978).