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A Selective Study of Clinical Diphtheric Myocarditis

by

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Introduction

Diphtheria is still not a rare disease in Indonesia, especially not in crowded areas (Kwari et al., 1965; Maemunah et al., 1965; Asril et al., 1968), often with high mortality in hospitals (Kwari et al., 1965; Maemunah et al., 1965; Asril et al., 1968; Sulianti, 1971).

The disease is caused by the *Corynebacterium diphtheriae* and is characterized by local pseudomembraneous lesions, usually on the tonsils, pharynx and adjacent tissues, rarely in the conjunctiva, vagina and skin. It causes local pain, edema and obstruction of the larynx, trachea and bronchi. Fever, prostration, cardiac damage and paralysis are constitutional symptoms. Early detection is very important although sometimes rather difficult. Usually, the diagnosis of diphtheria is made on clinical basis, and specific treatment is given without waiting for the outcome of laboratory test (Kwari et al., 1965).

Schick (1951) gives the following advice for an early diagnosis:

1. Examination of children is never complete without inspecting the throat for the detection of possible diphtheria.
2. In every case of infants with a profuse serous and somewhat bloody discharge from nose, nasal diphtheria should be considered.
3. Every spot outside the tonsils indicates a possibility of diphtheria. The same consideration has to be given to small white spots on the uvula.
4. Declining fever does not necessarily indicate an improvement of the disease. The diphtheria can progress and the general condition can become worse, in spite of the fact that the temperature comes down to normal.

Herderschee (1953) gives the following criteria for the general practitioner:

Every membrane on the posterior pharyngeal wall, or every membrane on one tonsil or both, which occupies half of the tonsil's surface or more should be regarded as diphtheria.

Complications are caused by exotoxin entering the blood, and the severity depends on early specific treatment (Moncrieff et al., 1953; Bradford, 1969). Peripheral vascular collapse caused by myocarditis is a complication frequently found (Bradford, 1969), also in Indonesia (Asril et al., 1968). Hanafiah et al. (1965) noted diphtheria in 90% of non rheumatic myocarditis. Paralysed peripheral nerves and toxic nephritis are other complications (Person et al., 1954; Bradford, 1969).

The purpose of this study is to evaluate the prognosis of clinical diphtheric myocarditis in a certain privileged group. All cases were collected from a ward with patients coming only from families with good or fair social condition.

Material and methods

In the period from January 1970 until to December 1971, 92 cases of diphtheria were admitted to that particular ward of the Department of Child Health Gadjah Mada University Hospital. These cases are a selective group that came to the physician or our hospital in the initial stage of illness. Diagnosis of diphtheria was based on clinical findings characterized by:

1. Fever of two days or more,
2. Pseudomembraneous lesions, or
3. Local spots, usually on the tonsil, pharynx and adjacent tissuea which did not change or extend after one or more antibiotic injections and
4. Confirmed by positive direct smear.

All cases belonged to the tonsil/pharynx type, except one which was combined with nasal and suspected conjunctival diphtheria (although conjunctival secretion smear was negative for diphtheria).

ECG examinations were made only when myocarditis was suspected such as in cases with soft and impure first sound, accentuated second sound at the apex; gallop rhythm, premature beats, bradycardia, tachycardia or cardiac failure (Person et al., 1954; Friedberg, 1957; Kwari et al., 1965).

ECG changes as ST segment depression, T wave changes, Right and left Bundle Branch Block, lengthening of PR, incomplete and complete A-V block tachycardia, atrium fibrillation, atrium flutter and lengthening of QT were looked for (Friedberg, 1957; Kwari, 1965; Maemunah, 1965; Goldman, 1967).

Discussion and results

Brodford (1969) noted a mortality rate of diphtheria of the disease ment was

day of the disease the mortality rate was about 0,3%, on the third day 4% and on subsequent days 25%. The mortality rate was highest among young infants (Bradford, 1969), according to Kwari et al. (1965) in the age group of two years and according to Asril et al. (1968) in the group of between 0 — 2 years.

During January 1970 to December 1971, 92 selected cases of diphtheria were admitted consisting of 51 girls and 41 boys, with ages ranging from

2 months to 11 years. The mortality rate of our cases was zero.

All of our cases belonged to the tonsil and pharynx type, except one case which had a combination with nasal diphtheria and suspected conjunctival diphtheria (although a swab of conjunctival secretion was negative).

ECG studies were made on 47 patients with suspected myocarditis, with the following results:

Years.	Normal ECG	Abnormal ECG	%	Total
1970	7	13	± 65	20
1971	16	11	± 40	27
	23	24	51	47

Result of ECG examinations:

ECG changes :	Cases :
1. Myocardial damage: (ST segment depression/ without T wave changes)	6
2. First degree heart block (lengthening of PR)	3
3. First degree heart block with myocardial damage	2
4. First degree heart block with sinus tachycardia	5
5. Sinus tachycardia	5
6. Sinus tachycardia with myocardial damage	3
	24

According to Fiedberg (1957) the earliest ECG changes of myocarditis are ST segment depression, fol-

lowed by T wave changes on two leads or more. Although conduction disturbances are much less frequent,

they are more distinctive of diphtheritic myocarditis and denote a serious prognosis.

First degree heart block and more severe grade of partial heart block has often been found. Right and left bundle branch block, complete A-V block are serious complications. Kwari et al. (1965) found 66,6% fatality with LBBB, 40% died with RBBB, and 100% with complete A-V block.

Other ECG changes are sinus tachycardia/sinus bradycardia, transient extra systoles, and nodal rhythm, paroxysmal tachycardia, atrium fibrillation, atrium-flutter and lengthening of QT.

Kwari et al. (1965) found ECG changes in 19,5% of 466 cases of diphtheria with a mortality rate of 40%. This rate was ten times that of patients with normal ECG (4%). ECG changes were found as follows:

T wave changes \pm 63,7%, LBBB \pm 13,2%, RBBB \pm 5,4%. Total A-V block 16,2% and ventricular fibrillation \pm 1,1%.

Maemunah et al. (1965) found 18 myocarditis cases out of 92 cases of diphtheria and fatality rate was 55,5%. Changes in ECG were: LBBB in 4 cases, RBBB in 1 cases, first degree heart block in 1 case, third degree heart block in 1 case, myocardial damage in 15 cases, arrhythmia such as sinus tachycardia in 6 cases, sinus bradycardia in 2 cases and nodal rhythm in 2 cases.

Sinus tachycardia is a sign of peripheral collapse. Kwari et al. (1965) often saw patients with diphtheria dying in shock syndrome without obvious ECG changes, but only sinus tachycardia, slight ST depression or low T waves.

The cardiac rate in infants is rapid and subject to wide fluctuation. The average rate, ranging from 120 -- 140 beats per minute with an increase during crying and activity, and decrease during sleep. As the child grows older the average pulse rate becomes slower. Hereby follows a table compiled from Kaplan (1969).

Age	Maximal normal rhythm
Newborn	170
2 years	160
4 years	130
6 years	115
8 years	110
10 years	110

Age	Maximal normal rhythm	
	female	male
12 years	110	105
14 years	105	100
16 years	100	95

Sinus tachycardia was diagnosed in our cases when frequency rate was more than the maximum normal rhythm.

Immunization has resulted in decrease of the mortality rate of diphtheria. In USA the incidence of diphtheria decreased rapidly after intensifying active immunization.

The number of reported cases decreased from 1580 in 1956 to 168 in 1965, and the number of deaths for these years decreased from 103 to 16 (Bradford, 1969). Most of the diphtheria cases of Maemunah et al. (1965) and Asril et al. (1968) were not immunized, fatality rate and ro, 1956 natural immunity is high. Influence of immunization in our cases is shown in the following table:

Cases	Immunized (DPT)	Non-Immunized
Abormal ECG : 24	12	11
Normal ECG : 23	6	18
47	18	29

Abnormal ECGs were lower in immunized cases than in non-immunized ones. According to Wallgren (1969) immunization gives an effective protection to children until 5 years or more. On the other hand, Henderson et al. (1971) noted effective protection for a decade or more, and protection against a fatal outcome for an even longer period.

Natural immunity in South East Asia has somewhat a similar pat-

tern, i.e. about 30% at one year of age, and 75% at 5 years. In Indonesia according to Sukamto and Tesch (1939-1941) (cited from Pusponegro, 1956) natural immunity is high in the first trimester, and in 5 to 12 years of age reaches 80 — 90%.

Natural immunity has been found high, i.e. 70% at the age of 5 months and at pre-school age (Munginah, 1971).

Abnormal ECG according to age:

Age	Normal ECG	Abnormal ECG
0—2 years	4	7
2—4 years	4	4
4—6 years	5	6
6—8 years	3	6
8—10 years	4	1
10—12 years	3	—

Conclusion

Low mortality rates (zero) and very mild ECG abnormality changes are found in selective cases of diphtheria among children belonging to families with good or fair socio-economic condition.

Summary

Ninety-two selected cases of diphtheria coming from good to fair socio-economic background were admitted to a special ward of the Department of Child Health, Medical School, Gadjah Mada University,

Jogjakarta, during the years 1970 and 1971.

In 47 out of the 92 cases, myocarditis was clinically suspected, and further examined by ECG.

The results were 24 cases ($\pm 51\%$) with abnormal ECG, and 23 cases ($\pm 49\%$) with normal ECG.

ECG abnormalities were recorded as sinus tachycardia, lengthening of PR, ST segment depression with or without T wave changes and considered as very slight.

Effects of immunization has been discussed.

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