RHEUMATIC FEVER IN AIRMEN :

STIGMA ANALYSIS WITH SOME CONTROLLED OBSERVATIONS ON CONVALESCENT DEPRESSION AND ARTHRALGIAS

BY
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Glover (1946) has traced the steady decline of acute rheumatism in the British armed forces over the last hundred years. The disease has become at once less common and less severe. Recent papers from English sources confirm this trend. Copeman (1944) reported 42 cases, only two of whom showed evidence of carditis, and Reynell described 25 consecutive cases, all with a mild course. Canadian and American reports showed, however, that among their troops severe forms of rheumatic fever were common. Ferguson (1943) reported 243 cases, 27 per cent. of whom had cardiac damage, and 6 per cent. a rheumatoid syndrome. Griffith (1946) found, among 1,046 American servicemen with the disease, 119 cases of rheumatic pneumonitis and 52 examples of the "acute fulminating" type.

The aim of this small study was to analyse the manifestations of acute rheumatism as they were seen in young British airmen stationed in the Midlands of England between December, 1946, and June, 1948, and from this analysis to make a picture of the form this protean disease took in our particular community.

Cases

There were 35 cases of rheumatic fever and nine cases of chronic rheumatic heart disease admitted to our general hospital during this period. These 44 cases formed 0.58 per cent. of the 7,560 total admissions to hospital. The long period of bed-rest required gave these patients an importance greater than their numbers suggest. In fact, they accounted for approximately 20 per cent. of the bed-days occupied in the medical unit.

Aetiology.—The patients were non-commissioned officers and airmen, the great preponderance being freshly enlisted conscripts. There was an emphasis on the younger age-group slightly disproportionate to the age distribution among the airmen in our region. Twenty-six of the patients had less than a year's service. Twelve months was roughly half the period of service at that time. (Quinn (1947) showed that rheumatic servicemen were likely to manifest their disease during their first year with the forces.)

The disease did not occur in epidemic form, and admissions were spread smoothly over the winter months. Cases were drawn from widely separated stations, the distribution being even from one to another.

Features of the Disease.—For the purposes of this study the features of the disease have been divided into three groups.

Major Criteria—(1) Migrating polyarthrititis.

(2) Carditis.

(3) History of previous rheumatic fever.

(4) Fever.

(5) Chorea.

Minor Criteria—(1) Pneumonitis.

(2) Tachycardia.

(3) Nodules.

(4) Erythema marginatum.

(5) Epistaxis.

(6) Abdominal pain.

(7) Elevation of the erythrocyte sedimentation rate (E.S.R.).

(8) Encephalopathy.

Ancillary Criteria—

(1) Infections in the 6 weeks preceding the onset of the disease.

(2) Residual arthralgia.

(3) Convalescent depression.

Table I (opposite) shows the incidence of these stigmata; it will be seen that 31 of the 35 cases had five or more.

Discussion of Table I and Definition of Criteria

Major Criteria

(1) *Arthritis*.—Migrating polyarthrititis was present in every case. This concurs with De Lee's statement (1947) that the adult form of the disease is still seldom seen without joint involvement. Table II (page 162) shows the joints involved in the acute phase; as is usual, the larger joints, and the lower limbs, bore the brunt of the attack. All grades of severity were seen, from the classical hot swollen tender joints to those with only slight pain on movement. Whenever the knees were involved there was, at some stage, evidence of fluid. Salicylate therapy brought rapid relief, and there was usually a latent interval of 1-2 weeks before the residual arthralgias, which are discussed below, made themselves felt.

(2) *Carditis*.—This was considered certain in the presence of:

(i) Heart failure (one case);

(ii) Pericardial friction rub or pericardial effusion (four cases);

(iii) Permanent diastolic bruit (eight cases);

(iv) Permanent apical systolic murmur (seven cases), if (a) holosystolic, moderately or very loud, constant at varied rates and in all positions, or (b) associated with radioscopic evidence of enlargement of the left auricle or of the whole heart. Master (1948) has re-emphasized the significance of these murmurs; White (1944) and Parkinson (1945) accept such findings as presumptive evidence of cardiac involvement.

Carditis was considered probable in the presence of:

(i) Transient diastolic murmurs (three cases),

(ii) Transient organic-type systolic apical murmurs (four cases),

(iii) Bradycardia (ten cases).

This last sign has been carefully analysed as a rheumatic phenomenon by Glazebrook (1941), who found it to be present in 30 of 100 cases and to carry a definite prognostic gravity. For the purposes of our series we defined bradycardia,

TABLE I

Case Number	Major				Minor								Ancillary				Total major	Total minor	Total ancillary	Total all stigmata
	Polyarthrits	Carditis	History of Rheumatic fever	Chorea	Fever	Pneumonitis	Tachycardia	Nodules	Erythemas	Epistaxis	Abdominal pain	E.S.R.	Encephalopathy	Residual arthralgia	Depression	Prior infections				
1	+	+			+	+		+	+			+		+		+	3	4	2	9
2	+	+	+		+		+					+		+	+	+	4	2	3	9
3	+	+	+		+		+					+		+	+	+	4	2	3	9
4	+	+	+									+		+			3	1	1	5
5	+	+	+		+				+	+		+		+		+	4	3	2	9
6	+				+							+		+			2	1	1	4
7	+	+	+									+		+	+	+	3	1	3	7
8	+	+			+							+				+	3	1	1	5
9	+		+		+							+		+		+	3	1	2	6
10	+	+			+	+	+					+	+	+		+	3	4	2	9
11	+	+			+							+		+		+	3	1	2	6
12	+	+			+							+		+	+	+	3	1	3	7
13	+	+		+	+				+			+	+	+		+	4	3	2	9
14	+				+		+					+			+	+	2	2	2	6
15	+	+	+		+							+					4	1	0	5
16	+	+			+							+		+		+	3	1	2	6
17	+	+										+		+	+	+	2	1	3	6
18	+	+			+					+	+				+		3	2	1	6
19	+	+	+		+			+			+	+		+		+	4	3	2	9
20	+				+							+		+		+	2	1	2	5
21	+											+		+	+		1	1	2	4
22	+	+	+									+		+		+	3	1	2	6
23	+				+	+	+					+		+	+	+	2	3	3	8
24	+				+											+	2	0	1	3
25	+	+			+							+					3	1	0	4
26	+				+		+					+		+	+	+	2	2	3	7
27	+	+	+		+			+		+	+	+		+	+	+	4	4	3	11
28	+	+			+							+		+			3	1	1	5
29	+	+			+							+		+			3	1	1	5
30	+				+		+			+		+				+	2	3	1	6
31	+				+							+		+		+	2	1	2	5
32	+	+	+		+						+			+		+	4	1	2	7
33	+	+										+		+		+	2	1	2	5
34	+				+							+		+	+	+	2	1	3	6
35	+	+	+		+	+		+	+			+	+	+	+		4	5	2	11
All	35	24	12	1	29	4	7	4	4	4	4	32	3	28	13	26	101	62	67	230

TABLE II
JOINTS INVOLVED IN ACUTE PHASE

Joint	Involvement		Total cases
	One	Both	
Knee	6	24	30
Ankle	5	16	21
Wrist	6	8	14
Shoulder	4	9	13
Elbow	5	3	8
Hip	3	4	7
Hand (fingers)	2	3	5
Foot (toes)	3	1	4
Spine	—		2
Temporo-Mandibular ..	—	1	1

retrospectively, as a resting pulse sustained for 2 days or more at a rate 20 beats a minute less than the sleeping pulse of the same patient recorded when all evidence of active disease was at an end. This cumbersome definition had the merit of allowing for individual variations. Of the ten cases with bradycardia, six showed other clinical evidence of carditis. Electrocardiographic records were obtained in six cases and showed the rhythm to be of sinus origin in each case. We did not detect interference dissociation (Bartlett, 1946), perhaps because we were seldom able to make more than one record of each case.

In all, then, 24 of our 35 cases showed some clinical evidence of carditis. In fifteen cases carditis was considered certain, and in nine, probable. It is noteworthy that of these 24 cases, eleven gave a clear history of a previous attack of rheumatic fever; of those cases without obvious carditis, only one had a positive history.

We did not employ the E.C.G. as a diagnostic criterion because we did not make records sufficiently frequently. Among cases in the same age-group, Blackman (1948) found 98.4 per cent. with abnormal records. Table III contrasts the average duration of a raised sedimentation rate.

TABLE III
AVERAGE DURATION OF RAISED E.S.R.

Carditis	Certain	Probable	No evidence
No. of cases	15	9	11
Average duration of raised E.S.R. (days) .. .	135	73	56

(3) *Past History*.—Twelve cases gave a clear past history of rheumatic fever; of these four gave a history of rheumatic fever in parents or siblings. All, save one, in this group showed evidence of carditis.

(4) *Fever*.—Twenty-nine of 35 patients showed fever sustained for 2 days or longer, or recurring over 5 days or longer. In general the initial temperature was 101-102° F., and there was a rapid fall with the institution of salicylate therapy. There were three cases of polycyclic type, with recurrence of fever in hospital. Four patients were febrile for more than 10 days in spite of a salicylate dosage of 240-360 gr. daily; two of these patients were febrile for more than 25 days.

(5) *Chorea*.—This was seen in only one patient.

D.W., a clerk (general duties), aged 18 years 11 months, had one year's service. His mother had had an attack of acute rheumatism. He himself had had no previous illnesses except coughs and colds. Six weeks before admission to hospital he was noticed to be nervous and forgetful, with weeping attacks, and began to stutter and to fidget. About 3 weeks before admission he was subject to disciplinary action for incompetence and stupidity; later he remarked of this episode, "I cried all the time, but, you know, I couldn't have cared less." Ten days before admission he developed tonsillitis, and a β -haemolytic streptococcus was recovered from his throat. Twenty-four hours before admission he became very ill, with fever, flitting joint pains, violent choreiform movements, and mental disturbance.

On admission (28.6.47) the essential findings were: temperature 101° F.; heavily furred tongue; hallucinated and grossly disorientated; choreiform movements involving the whole voluntary musculature; marked hypotonia; reflexes retained; both wrists and the left ankle swollen and tender; pulse 120, regular; apex in 5th intercostal space, 4 in. from the midline; holosystolic apical murmur, harsh and moderately loud, constant in all positions; other systems normal.

For the next 5 days his chorea and his mental disorder continued unabated in spite of increasingly heavy dosage of phenobarbitone; the movements then gradually became less in violence and frequency until, after 3 weeks, the signs of chorea were minimal. Resolution of the mental symptoms began on the 6th day and was complete by the 14th. He retained an amnesia for the period from 2 days before admission to the 10th day in hospital.

The acute arthritis resolved with salicylate therapy on the 4th day. He developed a stiff shoulder on the 23rd day with the characteristics of a periarticular fibrositis.

On the 5th day in hospital typical lesions of erythema marginatum appeared about the wrists, ankles, and trunk; they faded during the next 3 days.

The heart showed a transient apical diastolic bruit in the second month and an electrocardiograph at this time showed negative T-waves in the four classical leads. The apical systolic bruit became progressively more obvious, being ultimately classified as very loud, and at the 5th month radioscopy showed left auricular enlargement.

He became grossly obese before discharge.

This case, apart from chorea, showed carditis, polyarthritis, erythema marginatum, residual arthralgia, and, finally, obesity. It may be that the streptococcal infection, superimposed upon a developing chorea, was responsible for the severity of the disease.

Minor Criteria

(1) *Pneumonitis*.—Four patients showed pneumonitis as defined by Griffith (1946); two were examples of the acute primary group, preceding the onset of arthritis; two were secondary acute types. These four patients averaged 9.25 rheumatic stigmata apiece.

TABLE IV
ELEVATION OF E.S.R.

Duration of raised E.S.R. (days) ..	0-30	31-60	61-90	91-120	121-150	Over 150
Number of cases ..	3	9	10	4	2	6

(2) *Tachycardia*.—This was seen persisting in an afebrile phase in seven patients, three of whom had certain evidence of carditis.

(3) *Nodules*.—There were four patients with rheumatic nodules, all with certain carditis.

(4) *Erythema*.—Erythema was recorded on Table I only when the classical lesions of erythema marginatum were seen. There were four cases, all with certain carditis. Erythema nodosum had been diagnosed in one other patient 2 weeks before the onset of arthritis.

(5) *Epistaxis*.—This occurred in four cases. In three the bleeding, which was copious, preceded the exhibition of salicylates; in these patients, therefore, the disease, and not the drug, was responsible.

(6) *Sedimentation Rate*.—The E.S.R. is recognized as the most sensitive measure for detecting variations in rheumatic activity from time to time in any given case (Wasson, 1941). The E.S.R.s recorded in Table I as significant were required to show (a) an initial value above 65 mm. in the 1st hour (Westergren), and (b) a rate sustained above 10 mm. in the 1st hour for more than 30 days. Of the 35 cases, 32 satisfied this definition. High rates sustained over long periods were common in this series (Table IV).

(7) *Abdominal Pain*.—Pain in the abdomen occurred in four patients; in one it was associated with diarrhoea and was the presenting symptom. In no case did the pain dominate the clinical picture as it may in childhood (Hansen, 1943).

(8) *Encephalopathy*.—Bruetsch (1939; 1940; 1947a and b) has surveyed and extended the concept of rheumatic encephalopathy. He considered that, in its chronic form, it was responsible for a number of schizophrenic reactions in young adults. Warren (1947) found five cases with mental disturbance among 207 cases of rheumatic fever.

Among our 35 cases there were three with gross mental disturbance. One patient, described above, showed hallucinosis and disorientation associated with chorea gravis. The second case had identical mental symptoms without any signs of chorea. This patient presented as an acute fulminating type, with high fever, severe polyarthritis and a large pericardial effusion; he was grossly disorientated and hallucinated. Mental recovery was complete in 10 days and, like the first patient, he became obese when convalescent.

The third patient had had a severe rheumatic invasion with pancarditis, polyarthritis, nodules, and erythema marginatum. In the 5th month he was entering a quiescent phase, having established mitral and aortic valvular lesions. At this time it was noticed that he had become withdrawn and secretive. Ten days later

he attempted suicide, and succeeded in opening both pericardium and pleura with a knife. He was examined by a psychiatrist and found to be hallucinated and profoundly depressed. He was later certified because of increasing dementia of schizophrenic type.

Warren and Chornyak (1947) warned against the confusion of salicylism with encephalopathy: none of our patients were taking salicylates at the onset of their mental symptoms.

(9) *Convalescent Depressions*.—Apart from the gross aberrations just described, minor emotional disturbance was common. In the convalescent phase fifteen patients developed depressive symptoms. The syndrome, which was similar in each case, was mild and transient. It might have escaped notice, were it not that these patients were seen daily over several months. Further the medical officers were conscious of the danger of iatrogenic cardiac neuroses, and were, therefore alert to variations in the emotional tone of their patients. In the typical case symptoms began in the subacute phase of the disease, when the E.S.R. had fallen to between 20-40 mm. Over a few days lethargy and a sense of heaviness crept over the patient, he became quiet and depressed and so remained for about a week; symptoms then melted away leaving a normal personality.

There seemed four possible explanations for this syndrome.

- (a) Salicylism. This was ruled out by the fact that in all but two cases salicylates had been withdrawn for more than a week before the onset of symptoms;
- (b) Immobility. Our patients were treated with long periods of absolute and partial rest. Robertson (1946), appalled at the incidence of neuroses among rheumatic fever patients, studied the effect of early ambulation and achieved a sharp reduction in the number of neurotics by his methods. We were fortunate in having a group of patients to serve as a control in this particular. There were, in the same wards, 28 cases of primary sero-fibrinous pleural effusion. These cases and the rheumatic group were treated with nearly identical periods of absolute and partial rest. The two groups were parallel in age, length of service, and social origin; both groups knew that, after a long stay in hospital, they were likely to be discharged the Service on medical grounds; both groups were offered educational and occupational therapy. In no case did the depressive syndrome appear among the group with pleural effusion, although there were two cases of anxiety neurosis in each group;
- (c) It therefore seemed likely that the syndrome was dependent on the rheumatic process *per se*, and was analogous with the depression which follows influenza;
- (d) Hubble (1943) has re-emphasized that the rheumatic diathesis contains a quantitative increase in kinesis and emotional tension. Such a constitution might of itself determine a depressive reaction in a bedfast patient. However, in this series, since the rheumatic process was active at the time of study, distinctions between disease and diathesis would have been invalid.

The syndrome of convalescent depression is, of course, well known. It is stressed here because of the difficulty which we experienced in distinguishing this benign entity from the onset of a cardiac neurosis.

(10) *Residual Arthralgias*.—Fibrositic pains in the convalescent phase have been defined by Copeman (1944). Twenty-eight of our patients showed pain, stiffness, and signs suggestive of periarticular fibrositis in one joint or more during the subacute phase of the disease (Table V, overleaf).

TABLE V

JOINTS INVOLVED IN RESIDUAL ARTHRALGIA

Joint	Involvement		Total cases
	One	Both	
Shoulder	10	5	15
Knee	2	5	7
Elbow	1	3	4
Hand (fingers)	2	2 ("rheumatoid")	4
Ankle	1	2	3
Wrist	1	1	2
Foot (toes)	1	—	1
Spine	—		1

The fact that the shoulders were so frequently involved suggested that the posture of absolute rest, with the shoulders immobile, might have been the sole cause of the condition. The control group with pleural effusions were examined, therefore, and no comparable lesions were found in any patient. Nevertheless, it does seem possible that immobility played some part since (a) stiff shoulders commonly developed when hand and forearm movement was allowed, the patient still lying on his back; (b) the stiffness was worst in the mornings; (c) gentle movements under a radiant heat lamp gave much relief.

Two patients, in whom residual arthralgias of larger joints were prominent features, exhibited a "rheumatoid" syndrome in the hands. The essential features were pain and periarticular swelling of the metacarpophalangeal joints and wrists with rapid wasting of the associated muscles. Pain in the joints, and loss of power in the small muscles of the hands, lasted a few weeks; the pain then resolved, and there was a rapid return of mobility, and regeneration of the muscles. No permanent damage remained; radiographs showed no changes in the bones or joint spaces. It seems possible that the underlying pathology was the same in the residual arthralgias and in this "rheumatoid" syndrome, the difference in signs being due simply to the type of joint involved.

(11) *Prior Infection*.—Streptococcal infection commonly initiates the rheumatic process (Coburn, 1940; Parkinson, 1945; Griffith, 1947; Kerr, 1948). Twenty-six of our cases had a history of an infection, usually a sore throat, in the six weeks preceding their attack, and this was employed as a confirmatory diagnostic factor.

Outcome.—All patients were required to walk briskly over a measured mile before they were discharged. Two patients, both with double valve lesions, showed

a pulse rate persistently raised for more than an hour after the conclusion of the walk. One patient, with neuro-circulatory asthenia, complained of breathlessness. The remaining 41 patients showed neither discomfort nor persistent tachycardia. This agrees well with the findings of Wilson (1948), who showed that 90 per cent. of known rheumatics with cardiac involvement were able to perform their work without symptoms.

Characteristics of the Series.—Jones (1944), Griffith (1947), Taran (1946), and Sokolow (1947) have each laid down major and minor criteria for the diagnosis of rheumatic fever. The emphasis varies from author to author, nor is this unexpected in a disease so sensitive to variations in ecological influences.

Among our patients the disease appeared as a febrile polyarthritis following an upper respiratory infection, and showed carditis and a prolonged elevation of the E.S.R. Residual arthralgias, bradycardia, and a convalescent depression emerged as integral features of the syndrome. Although many were left with obvious cardiac damage, all were capable of work when discharged.

It appears probable, then, that serious rheumatic disease is still prevalent among conscripts in Great Britain. The benign cases described by Copeman (1944) and Reynell (1948) were studied in very different environments; Copeman's were in the desert and Reynell's in Italy, whilst our patients were in the Midlands, long ago condemned by Hilaire Belloc as "sodden and unkind". Sampson (1945) has shown the importance of the physical environment in determining the nature of rheumatic disease.

Twenty of the 44 cases of rheumatic disease seen in this period gave a clear history of an attack of rheumatic fever in childhood. It might perhaps be useful to place such men under special supervision throughout their service. Wilson (1948) in a series of more than a thousand well-supervised rheumatics, found a recurrence rate after puberty of only 3·9 per cent.

Summary

A consecutive series of 35 cases of rheumatic fever in young airmen was studied. The stigmata of the disease were analysed, and carditis, residual arthralgias, bradycardia, and a convalescent depression found to be integral features of the disease in this group. That the depressions and the arthralgias were truly rheumatic symptoms was confirmed by their absence in a control group of 28 patients with pleural effusions.

It is suggested that environmental factors may have determined the severity of the disease.

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Rhumatisme Articulaire Aigu chez les Aviateurs

RÉSUMÉ

On étudia une série consécutive de 35 cas de rhumatisme articulaire aigu chez de jeunes aviateurs. Les stigmates de la maladie furent analysés et on trouva que la cardite, les arthralgies résiduelles, la bradycardie, et la dépression des convalescents formaient des caractéristiques intégrantes à la maladie dans ce groupe. Le fait que la dépression et les arthralgies étaient réellement des symptômes rhumatismaux fut confirmé par leur absence dans un groupe de 28 témoins atteints de pleurésie exsudative.

On suggère que les facteurs du milieu ambiant auraient pu déterminer la sévérité de la maladie.

Reumatismo Articular Agudo en los Aviadores

RESUMEN

Se ha estudiado una serie consecutiva de 35 casos de reumatismo articular agudo en jóvenes aviadores. Los estigmas de la enfermedad fueron analizados y se halló que la carditis, las artralgias residuales, la bradicardia, y la depresión de los convalecientes constituían rasgos integrantes de la enfermedad en este grupo. El hecho que la depresión y las artralgias eran realmente síntomas reumáticos fué confirmado por su ausencia en el grupo de 28 testigos sufriendo de pleuresía exudativa.

Se sugiere que factores del medio ambiente hubieran podido determinar la severidad de la enfermedad.