RHEUMATIC HEART DISEASE IN SERVICE PENSIONERS

A REVIEW OF 318 CASES

BY

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During the 1939-45 war cardiologists recorded their experience in the diagnosis of early chronic rheumatic heart disease in recruits. In spite of excellent work by medical boards, backed by specialist opinion, a small proportion of men with this condition were accepted for service. This paper reports the subsequent course of 318 such men re-examined after discharge while drawing disability pensions. In only one of these had the opinion of a cardiologist been taken before entry. The age at diagnosis varied from 18 to 50, and it may be presumed that the disease was already present on entry, for all had well-established valvular disease at the time of diagnosis. The lesions present are shown in Table I. In only five cases had an

TABLE I.—Incidence of Clinical Valvular Disease Found in 318 Men at Time of Diagnosis

Mitral stenosis	82 (25.7%)
Aortic incompetence	77 (24.2%)
Mitral stenosis and aortic incompetence	127 (39.9%)
Aortic stenosis and incompetence	19 (5.9%)
Mitral stenosis, aortic incompetence, and aortic stenosis	13 (4.0%)

apical systolic murmur been noted on entry. In view of the fact that many hundreds of men with incidental systolic murmurs were accepted for service on specialist advice it is apparent that clinically the problem of distinguishing incidental from organic systolic murmurs has been largely solved. At the time of invaliding three of these five had mitral stenosis and aortic incompetence and two had mitral stenosis only. Seven other men had hypertension in addition to the valvular lesion.

After the 1914-18 war Grant (1933) analysed 736 cases invalided with valvular heart disease, and his figures show aortic lesions in nearly 60%, compared with 74% in this series. Both these figures were high and do not represent the true incidence of aortic valvular involvement, for aortic valvular disease is more readily missed than mitral valvular disease in routine examination, and so those with aortic lesions are more likely to enter the Forces, yet rheumatic aortic lesions are far commoner than is generally realized.

A history of previous rheumatic infection was obtained in only 37% in this series—a low figure; 100 men reported an attack of rheumatic fever, 15 of chorea, and 3 of both diseases.

Medical boards were much influenced by such a history, and many men were referred to cardiologists for this reason alone. This largely explains the low percentage of positive histories in this valvular series.

The features leading to diagnosis are given in Table II.

TABLE II.—Features Leading to Diagnosis in 318 Men With Chronic Rheumatic Heart Disease

Rheumatic fever	98 (31%)
Dyspnoea on effort	73 (23%)
No symptoms. Discovered at routine examination	104 (33%)
Haemoptysis	17
Anxiety state	7
Onset of auricular fibrillation	5
Mass radiography	5
Bacterial endocarditis	4
Congestive cardiac failure	1
Paroxysmal tachycardia	1
Embolic phenomena	1
Angina of effort	2

Cases with Recurrence of Rheumatic Fever.—The expected recurrence rate of rheumatic fever at the age of

20-25 is approximately 5% (Wilson, 1940). A Service rate of 31% is very high. Although a few men were under active service conditions when they had their relapse, most admitted that they were in good billets. It was apparently the open-air life and exposure to chill during training that brought about so many relapses. There was an increased liability to relapse in those who had had a previous known attack. In this group 51% relapsed within two years of enlistment, while only 13% served over five years. The valve affected in the 98 patients who developed acute rheumatic fever in the Service was the aortic in 35 (36%), the mitral in 18 (18%), and the combined lesion in 45 (46%). This is surprising, but the figures are hardly adequate for definite conclusions to be drawn. A previous rheumatic history was recorded in 50% of these men. There was no difference in the age at relapse between those with such a history and those without it.

Cases Reporting with Dyspnoea.—Only 27.4% of these men had a previous rheumatic history. The age at which the symptom appeared is that which would be expected from present knowledge of the natural history of the disease. There is no evidence that it was precipitated prematurely by the vigorous Service training. In this group 42% reported dyspnoea within two years of enlistment, while 27% served over five years.

Cases Diagnosed on Routine Examination.—A previous rheumatic history was recorded in 31%. The diagnosis in 16 was made at the demobilization examination. The percentage of men with a cardiac neurosis superimposed upon their disability is high. This is due to a failure on the part of doctors to explain the condition to the patient at the first diagnosis. Too often a man's sole knowledge about a cardiac affection is derived from the more sensational novels and films. Among the 104 men diagnosed on routine examination, all denying dyspnoea prior to diagnosis, over 80% claimed the advent of their symptoms within six months of diagnosis. This is due to two facts: first, the development of cardiac neurosis, and, secondly, the over-restriction of activities. All 104 had done their full Army training—the majority one battle course and a high percentage two or more such courses—yet they had no dyspnoea until they were told to go carefully. Lack of training alone may account for this symptom. A history of collapse or heart failure during exercise was not found among these 104 men or among the 73 reporting with dyspnoea.

Cases with Haemoptysis.—The percentage presenting with an initial haemoptysis was small—17 men (5.3%). In most cases there was prolonged dyspnoea as a result of work in full kit or wearing gas masks before haemorrhage occurred. The great importance of haemoptysis as a symptom of mitral stenosis does not seem to be fully appreciated. Often there was considerable delay while lung investigations were carried out and before the correct diagnosis was made. Five men entered sanatoria; one of these had four postero-anterior x-ray plates of the chest taken before the true condition was recognized.

Cases with Bacterial Endocarditis.—The percentage of men with subacute bacterial endocarditis in this series is low and many must have died from the disease before the introduction of penicillin. Those who survived were permanently disabled and none were fit for work.

Discussion

That most of the 318 cases could have been diagnosed before entry is without question. Twelve admitted that they were rejected as volunteers and later were accepted as conscripts. One man was invalided from the Guards and

then joined the Royal Air Force. These keen men persevered until they had their own way, and came to no harm while doing excellent service.

Failure to carry out a full clinical cardiac examination such as recommended by Parkinson and Hartley (1946) accounted for most acceptances. In many men auscultation failed to reveal the mitral diastolic or presystolic murmur with the patient in the standing position, when these conditions were obvious with the man lying in the left lateral position after exertion. In the same way many aortic diastolic murmurs could be heard only when the breath was held at the end of full expiration with the patient sitting. But there is often a silent period in the natural history of rheumatic fever when no murmurs may be present, and in the absence of radiological enlargement a positive diagnosis is impossible. The early diastolic murmur of aortic incompetence may be difficult to hear unless there is absolute quiet, and many boards did not work under such ideal conditions. Boards were handicapped by the absence of facilities for routine radioscopy and so depended entirely on the clinical findings.

More attention might have been paid to the apex beat. The apex beat as a physical sign has two components—position and type of impulse. The position is defined as the furthestmost point outwards and downwards at which the impulse raises the examining finger. This point is an extremely accurate guide to the left cardiac border, except in those with a broad chest and those with a vertical heart. Normally the position lies within the mid-clavicular line. Among these 318 men both position and character were normal in only 20. In 154 the position was normal but the type of impulse was diagnostic: mitral stenosis gives a sudden impulse, aortic incompetence a forcible one. Over 200 normal young Naval officers were examined as a control, and in none was the type of impulse abnormal, while in only two was the position beyond the mid-clavicular line. These were both broad short men, and the coincidence of the apex beat as defined above with the radiological left border of the heart was confirmed in these officers.

Radiology

The radiological findings of established chronic rheumatic heart disease are well known, and the use of mass radiography in the future will ensure that most men with the disease will not be accepted for military service (Maclean and Rogen, 1949). It will not exclude all. The limitation of mass radiography in heart disease is that the postero-anterior film only is taken, whereas the earliest change in mitral stenosis is enlargement of the left auricle, shown in the right oblique position with barium in the oesophagus.

Parkinson and Hartley (1946) found this to be the only certain x-ray change in 74% of 104 symptomless recruits with presystolic murmurs, while in 13% there was no change in the size or shape of the heart. The same observers could find no change in the heart's appearance in 16% of 202 men with symptomless rheumatic aortic incompetence. Full-plate radiographs, usually only postero-anterior, were taken of 264 men in this series at the time of the first diagnosis. Of these, 215 hearts (81.4%) were reported as enlarged, while 44 (16.6%) were reported as normal. The valvular lesions found in these 44 men are shown in Table III. The high percentage of radiographs

reported to be normal in this series is discouraging, for if enlargement is not detected on the full-size plate it is unlikely to be recognized on the miniature film. Five more (1.9%) were diagnosed on mass radiography. Three of these had mitral stenosis, one aortic incompetence, and one both.

It is during the silent period of the disease that radiology is the only method of detection. Wilson (1940) says that, in her patients, while the auscultatory signs of cardiac involvement might disappear or become uncharacteristic during the course of the disease, cardiac enlargement was demonstrable at all times. Hartley (1948) has pointed out that aortic incompetence may cause enlargement before the aortic diastolic murmur is heard, while, as Parkinson (1949) has emphasized, the x-ray appearance often suggests further auscultation, with positive results.

It has always been well known that the patient with a chronic rheumatic heart fares badly in the armed Forces. He should not be accepted, as it is impossible to foresee which case will deteriorate and which will not.

The figures in Table I show that men with chronic rheumatic heart disease who are accepted for the Forces fall mainly into three groups from the medical point of view.

In the first group there occurred during service some incident of the rheumatic disease which might be expected to affect permanently the natural history of the disease in that man. Such incidences are the recurrence of rheumatic fever, auricular fibrillation, bacterial endocarditis, heart failure, angina of effort, or embolic phenomena. In all these cases, although such complications might have occurred in civilian life, the prognosis has been made worse. Hence a permanent increase in the disability must be accepted as a medical fact. Of the 318 men 34% are found in this group.

In the second group fall those men whose initial symptoms occurred during service, but in whom there was no specific incident that might be expected to influence the ultimate prognosis. Dyspnoea was the main symptom. Haemoptysis in 17 cannot be said to have done any permanent damage. Paroxysmal tachycardia is a disorder of function only. Nearly 29% fell in this second category. The presenting symptom can in no way be associated medically with military service, for between the ages of 20 and 30 the onset of symptoms is to be expected.

The remaining third of the cases had no symptoms before the diagnosis at routine examination. Over 80% of these developed dyspnoea within six months of this knowledge. It would appear that Service life with daily exercise improved their condition, and allowed them to exert themselves more than they would have been able to do otherwise.

It was the overrestriction of their activities, together with inadequate knowledge of their own condition, that precipitated symptoms.

Summary

Of the 318 men drawing disability pensions for chronic rheumatic heart disease who were re-examined, 74% had an aortic-valve lesion.

Only five men had an apical systolic murmur on entry, and the conclusion is drawn that the many hundreds of men accepted with incidental apical systolic murmurs were correctly assessed and so provide remarkably few of the cases here examined.

Most of the cases (87%) were revealed in three main ways—31% had a recurrence of rheumatic fever, 23% developed dyspnoea, and 33% were discovered on routine examination. These three groups of cases are discussed in detail.

TABLE III.—*Valvular Lesion in 44 Men Whose Postero-anterior Film Was Reported as Normal at the Time of Clinical Diagnosis*

Mitral stenosis	..	..	..	..	..	..	8
Aortic incompetence	..	..	..	..	..	..	13
Mitral stenosis and aortic incompetence	..	..	..	..	..	..	19
Mitral stenosis, aortic incompetence, and aortic stenosis	..	..	..	..	..	..	2
Aortic incompetence and stenosis	..	..	..	..	..	..	2

The reasons why medical boards failed to diagnose and exclude these cases from service are discussed, with special reference to the importance of the position and type of the apex beat in diagnosis.

Increased disablement from a purely medical point of view occurred in only 34% of the total. It was caused by recurrent rheumatic fever, bacterial endocarditis, auricular fibrillation, angina of effort, and the occurrence of emboli or cardiac failure.

The importance of radiological examination of the heart and the potential value of mass radiography are discussed.

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DECAMETHONIUM IODIDE AS A CURARIZING AGENT IN GENERAL ANAESTHESIA

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The following series of 208 cases in which decamethonium iodide (C10) was used as a curarizing agent, in conjunction with most general anaesthetic agents, may prove of interest to those who are not convinced of its value as a substitute for D-tubocurarine chloride.

C10 is the decane derivative of bistrimethylammonium iodide. It is a white crystalline water-soluble salt, which forms a stable neutral solution. On intravenous injection both in experimental animals and in human beings it produces a neuromuscular block with little or no effect on the autonomic ganglia. The fact that it is cheap to synthesize and mixes readily with thiopentone sodium, together with its curarizing properties, makes it an even more attractive proposition.

Clinical Series

In all the 208 cases, with the exception of those in which caesarean section was performed, premedication with "omnupon," $\frac{1}{2}$ gr. (22 mg.), or morphine, $\frac{1}{4}$ gr. (16 mg.), and hyoscine, 1/150 gr. (0.43 mg.), or atropine, 1/100 gr. (0.65 mg.), was carried out between 30 and 60 minutes before operation, and anaesthesia was induced with thiopentone sodium in doses varying from 0.4 to 1 g. For the caesarean sections premedication was carried out with atropine, 1/100 gr., and induction with cyclopropane and oxygen. The ages of the patients ranged from 12 to 79 years. The following are the operations for which the method was used.

Operation	No.
Oesophagoscopy	10
Bronchoscopy	5
Tonsillectomy	18
Mastoidectomy	10
Thyroidectomy	8
Dental operations	20
Facial and neck operations	13
Upper abdominal operations (including gastrectomy, gastro-jejunostomy, perforated peptic ulcers, cholecystectomy)	14

Laparotomy (appendicectomy, colostomy, excision of colon, etc.)	9
Herniorrhaphy	21
Prostatectomy	10
Nephrectomy	4
Anal and rectal operations	12
Thoracic sympathectomy	4
Caesarean section	13
Mastectomy	3
Amputation of leg	3
Laminectomy	10
Orthopaedic, unclassified	11
Unclassified, miscellaneous	10

Administration and Results

C10 may be injected intravenously either as a mixture with thiopentone sodium or by itself. Dosages of from 2 to 5 mg. have been used on different cases, and to produce full muscular relaxation an initial dose of 4 mg. was found to be the best. This produced excellent relaxation of the abdominal musculature for as long as 25 minutes, but also brought about apnoea due to respiratory paralysis for five to ten minutes after the full effect was obtained, which was usually some three to five minutes after the original injection.

Experiments carried out on the conscious patient by Organe, Paton, and Zaimis (1949) indicated that with a dose of 3 mg. of C10 the respiratory musculature was not in any way affected. It has been found here, however, that even with this dose there was apnoea for one to three minutes, while adequate abdominal relaxation was not always obtained. In this respect it differs from D-tubocurarine chloride, which does not always produce respiratory arrest with an equivalent dosage.

Repeated doses have not the cumulative effect that D-tubocurarine chloride has, and a maximum of 15 mg. of C10 has been given without ill effects, recovery taking place as after a single dose.

Continuous or intermittent injections of a thiopentone C10 mixture have been used with success in most of the herniorrhaphies and in a large number of the intra-peritoneal operations, but the resulting apnoea makes it desirable to intubate these patients and to keep them well oxygenated.

The experimental work of Young (1949) on near-term guinea-pigs and rabbits suggests that C10 does not pass the placental barrier, and clinical trials by Organe (1949) indicate that this is so. In the 13 caesarean sections in this series, using doses of 2 to 3 mg. injected 10 to 15 minutes before delivery, we have found that the infant was definitely more flaccid and reluctant to breathe than after cyclopropane, oxygen, ether, or gas-oxygen-ether anaesthesia. It would seem, then, that C10 does cross the placenta into the foetal circulation, although more slowly and in smaller quantities than D-tubocurarine chloride. Recovery of muscle tone in these babies is fairly rapid.

Side-effects.—No deleterious side-effects were noted in any of these cases. One death occurred at the end of a partial gastrectomy for uncontrollable haematemesis. This patient was not, however, in the best condition, and some difficulty was experienced in keeping him oxygenated. Post-mortem examination revealed bilateral basal pneumonitis, with a large amount of purulent exudate and an advanced degree of myocardial degeneration.

Discussion and Conclusions

The use of C10 in short operations is clearly indicated to avoid the respiratory depression so often seen after the use of D-tubocurarine chloride. In all cases in which