The Dangers of Electrocardiography in General Practice

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SUMMARY: The use of the electrocardiograph by general practitioners was studied by scrutiny of 100 successive referrals to the Department of Clinical Electrophysiology. 31% of referrals were on patients with chronic, recurrent chest pain and a further 13% were on patients with a recent episode of acute chest pain. The ECG is of limited diagnostic value in patients with chest pain, and it may be both misleading and time-wasting when used inappropriately by general practitioners.

Introduction

This hospital offers an open-access electrocardiographic service for GPs. Patients may be referred directly to the Department of Clinical Electrophysiology (D.C.E.) for an ECG, or alternatively, ECGs, performed by GPs themselves, may be referred for specialist interpretation. A report is usually forwarded within a week.

In the 6 month period before this study, 2 patients, referred to the D.C.E. by their GP, were admitted to the coronary care unit (CCU) with the ECG changes of evolving myocardial infarction. These apparently inappropriate referrals, causing delay in admission to the CCU, prompted a study of referrals to the D.C.E., in order to assess the use of the ECG by GPs, particularly in patients with chest pain.

Methods

One hundred successive referrals to the D.C.E. were scrutinized. ECGs obtained from aircrew for screening purposes were excluded from the study.

The clinical details were categorized as follows:-

a) *Acute chest pain.* A history of a recent acute event featuring chest pain was given, such as "central chest pain last night", or "retrosternal chest pain for last 24 hours".

b) *Chronic chest pain.* A history describing recurrent chest pain over a variable time span was given, such as "12 month history of chest pain", or "angina on exertion". If "chest pain" was the only clinical detail, the case was placed in this group.

c) *Atypical chest pain.*

d) *Possible Pericarditis.*

e) *Hypertension.*

f) *Arrhythmia.* The history specified a clinical suspicion of arrhythmia, such as "episodes of tachycardia" and "irregular pulse".

g) *Syncope/collapse/dizziness.* The history referred to single or multiple events without specifically detailing a suspected cardiac diagnosis, such as "collapsed on a run", or "dizzy spells".

h) *Screening.* This group included histories such as "FH of heart disease", and "proposed charity race".

The specialist's report was classified as either

"normal" or "abnormal". The latter classification included reports of non-specific abnormalities such as "solitary T wave inversion in AVL...", and "borderline left axis deviation".

A retrospective search of laboratory records was made to see if the patients in the "acute chest pain" group had had blood taken for estimation of cardiac enzymes.

A retrospective search was also made through death records and the CCU admissions-register for cases illustrating inappropriate use of the ECG.

Results

In general, the reason for requesting the ECG was clear. 5 normal ECGs were received for interpretation with no clinical details. These cases were excluded from the study.

Of the remaining 95 cases, there were 52 requests for an ECG to be performed and 43 requests for ECG interpretation.

The categorization of these cases is shown in Table 1. Twelve patients, with an average age of 45.5 years (range 30-63), had a history of acute central chest pain in the previous 24-48 hours. In 3 cases, the request was for a report on an ECG, and, in 9 cases, the patient was referred to the D.C.E. The clinical details suggested that the general practitioner was, at least, suspicious of

Table 1
Specialist interpretation of ECG

Clinical details	Normal	Abnormal	Total
Chest pain - acute	9	3	12
- chronic	27	2	29
- "atypical"	3	0	3
- ? pericarditis	4	1	5
Hypertension	10	1	11
Arrhythmia	14	5	19
Syncope/collapse/ dizziness	7	0	7
Screening	9	0	9
Total	83	12	95

myocardial infarction. Indeed, 8 (67%) of these patients also had blood samples taken for estimation of cardiac enzymes.

3 of these 12 patients had abnormal ECGs. In 2 cases, the patient was known to have had a previous myocardial infarction, and therefore the presence of pathological Q-waves and inverted T-waves, in the absence of ST elevation, did not aid diagnosis. In 1 case, the ECG of a 41 year old male with a history of chest pain overnight showed an evolving full-thickness anterior myocardial infarction. This abnormality was detected by the D.C.E. technician and the patient was admitted to the coronary care unit, where he made a satisfactory recovery.

There were 29 cases where the clinical details suggested angina. The 27 cases with normal ECGs cannot be dismissed as not having ischaemic heart disease, and the 2 cases with T-wave abnormalities may still have had non-cardiac pain.

In only 1 case out of 5, was there ECG evidence to support the clinical suspicion of pericarditis.

Only 1 of the 11 hypertensives had an abnormal ECG, showing left axis deviation.

The abnormalities detected in the arrhythmia group comprised 1 case of atrial fibrillation and 4 cases with occasional extrasystoles.

None of ECGs in the atypical chest pain, syncope/collapse/dizziness, or screening groups were abnormal.

Illustrative cases

Cases 1 and 2 were selected from recent records of unexpected deaths and case 3 occurred after completion of the study.

Case 1

A 38 year old male attended his GP on a Monday complaining of acute chest pain overnight. This was thought to be of dyspeptic origin and he was prescribed an antacid. On the Thursday morning, he reattended with further chest pain. An ECG, performed by the GP, was thought to be abnormal, was referred for specialist interpretation. A blood sample was taken for cardiac enzymes and an alternative antacid was prescribed. That evening, at home, the patient vomited following his dinner and retired to bed feeling tired and dyspnoeic. Within the hour he was found to be dead.

An autopsy confirmed severe coronary artery disease and a recent myocardial infarction. The cardiac enzymes were compatible with infarct on Sunday night and extension on Wednesday night.

Comment

The GP was correctly suspicious of myocardial infarction when the patient reattended on Thursday. This suspicion alone should have prompted urgent referral to hospital, although the outcome may still have been the same in the light of the severity of the coronary artery disease.

Case 2

A 40 year old male attended his GP at 1100 hrs. with chest pain of 1 hour duration. By 1120 hrs., he had been examined and an ECG had been performed. At 1130 hrs., whilst this ECG was being interpreted, he was given an antacid with some relief of symptoms. The ECG showed evidence of an acute septal infarct and, at 1145 hrs., he left by ambulance for the nearest Service hospital. The patient had a fatal cardiac arrest as the ambulance arrived at the hospital. An autopsy revealed a fresh thrombus in the left anterior descending coronary artery but little evidence otherwise of vascular disease.

Comment

This case demonstrates the necessity for urgent admission to a coronary care unit, once a diagnosis of myocardial infarction is suspected. There was at least a 20 minute delay, without which the patient would probably have been in the coronary care unit when he arrested, and his presumed ventricular fibrillation could have been quickly treated. The autopsy findings suggest that this patient had a potentially good prognosis. It must not be forgotten that the vast majority of deaths from myocardial infarction occur within the first few hours and are due to eminently treatable arrhythmias.

Case 3

A 38 year old male attended his GP on a Thursday morning with acute chest pain overnight. He had had chest pain on exertion 4 years previously but no investigations, including a Thallium scan, had been normal. He had an ECG which was normal (even in retrospect) and he was sent home for 48 hours rest with some strong oral analgesics, after blood had been taken for cardiac enzymes. He was admitted to the station medical centre in the early hours of Friday morning because of further severe chest pain. At 0830 hrs, he was given sub-lingual GTN which relieved his continuing chest pain. As a repeat ECG was noted to be suggestive of inferior infarction, he was then urgently admitted to the nearest Service hospital, where, on admission to the coronary care unit, he was noted to be in mild left ventricular failure. He eventually made a satisfactory recovery. Cardiac enzymes were compatible with infarction on Wednesday and extension on Thursday.

Comment

The GP made an accurate clinical diagnosis at first presentation but was obviously misled by the normal ECG. Again this is conjecture, but admission on Thursday may have permitted the early use of aspirin and streptokinase, which has been shown to be effective in reducing mortality associated with, myocardial infarction¹.

Conclusion

The ECG is a useful tool in the evaluation of hypertension and suspected arrhythmia, although significant abnormalities are infrequent. Its use to assess cardiovascular fitness is debated^{2,3}. Although even non-specific abnormalities may be significant⁴, there is a low incidence of such abnormalities in asymptomatic individuals⁵. If a specific diagnosis of pericarditis is considered, then an ECG may occasionally be helpful, but history, examination, and measurement of the erythrocyte sedimentation rate are more likely to be diagnostic.

The diagnosis of angina pectoris is made on the history. An ECG forms part of the evaluation for referral, but has a low probability of yielding a definite diagnosis.

If a patient's acute chest pain is suspected of being due to a myocardial infarction, urgent admission to a coronary care unit, without prior electrocardiographic investigation, is warranted in most cases for monitoring, treatment of arrhythmias and, nowadays, consideration of thrombolytic therapy.

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