Original Article

Problems of nonspecific ECG abnormalities amongst aircrew

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ABSTRACT

This paper presents an analysis of nonspecific ECG abnormalities amongst aircrew with special emphasis to its aeromedical significance. 115 aircrew were evaluated for ECG abnormalities. Out of 115 cases, there were 90 (78.26%) cases with nonspecific S-T and / or T wave abnormalities and 25 (21.74%) cases with specific ECG abnormalities like conduction defect, cardiac arrhythmias and preexcitation syndrome etc. Out of 90 nonspecific ECG abnormalities, there were 70 (77.78%) of T wave, 15(16.67%) of S-T wave and 5 (5.55%) of both S-T and T wave abnormalities During follow up 1333% of nonspecific ECG abnormalities were found to develop changes specific for coronary artery diseases and 66.66% of these had one or more than one coronary risk factors.

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Atherosclerotic heart disease is a major public health problem. Early detection of coronary artery disease is especially of greater significance in certain selected occupation like aerospace operation, where inflight incapacitation may be hazardous. The detection of coronary artery disease by ECG evidence of significant ST and T wave changes is well known. But ST and T wave changes may not always be significant to meet the criteria of coronary artery disease and then get labelled as nonspecific ST / T changes. These changes may be primary or secondary to other conditions like anxiety, postprandial, hyperventilation effect of posture, persistence of juvenile pattern, related to ethnic groups, high altitude, abdominal and metabolic disorders etc. Diagnosis needs to be established

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by detailed cardiac work up, which involves DMT, TMT, 24 hour Holter monitoring, echocardiography and other tests before declaring these as nonspecific. In doubtful cases coronary arteriography (CART) needs to be done to rule out any significant coronary artery disease (CAD).

However, they do pose diagnostic and prognostic dilemma and are have of far reaching implications in cardiovascular evaluation of aircrew whether these nonspecific abnormalities warrant regular surveillance and special emphasis on primary prevention as a risk group or, these nonspecific abnormalities are to be ignored? What are the prognostic considerations in terms of immediate and remote medical fitness of an aircrew? Keeping in mind above facts, this study was under taken.

Material and Methods

All aircrew reporting to IAM and showing ECG abnormality were thoroughly evaluated including history, physical examination and relevant investigations which included ECG resting and DMT, tread mill test (TMT) and biochemical parameters. Echocardiography and Holter, monitoring were performed wherever indicated. Coronary arteriography was performed in selected cases. Manoeuvres like upright posture, Valsalva and hyperventilation during ECG recording were done wherever indicated. Evaluation of coronary risk factors inclusive of biochemical parameters was done in all the cases. All cases of abnormal ECG pattern were subjected to follow up graphs with regular periodicity.

Result

Out of 115 cases, there were 90 (78.26%) of nonspecific ST and / or T wave abnormalities and 25 (21.74%) of specific ECG abnormalities. Of these total cases, maximum (60.87%) were of nonspecific T wave changes (Table - 1).

Table - 1 Pattern of ECG abnormalities amongst aircrew (n = 115)

ECG abnormalities	No.	%
Nonspecific	90	78.26
T Wave	70	60.87
ST Wave	15	13.04
ST and T Wave	5	4.35
Specific	25	21.74
Conduction defect	12	10.43
Cardiac arrhythmia	10	8.70
Pre excitation syndrome	1	0.87
Others	2	1.74

Table - 2

Nonspecific S-T and / or T wave changes (n = 90)

Nonspecific ECG abnormalities	No.	%
T Wave	70	77.78
ST Wave	15	16.67
ST and T Wave	5	5.55
Total	90	100

Table - 3

Age distribution for nonspecific ECG abnormalities (n = 90)

Age (years)	No.	%
30	2	2.22
31 - 40	60	66.66
41 - 50	25	27.78
> 50	3	3.34
Total	90	100

Table - 4

Progression of nonspecific ST and / or T wave abnormalities (n = 90)

ST and / or T wave changes	No.	%
Reverted back to normal	8	8.89
Remaining nonspecific with out any significant alteration of pattern	70	77.78
Progressing to coronary artery disease	12	13.33
Total	90	100

Table - 5

Relationship of coronary risk factors to nonspecific ST / T changes Remained nonspecific or reverted back to normal = 78
Progresed to coronary artery disease = 12

Risk factors	Remained or reverted	nonspecific to normal	Progressed to artery disease	coronary
	No.	%	No.	%
One	22/78	28.21	4/12	33.33
Two	16/78	20.51	3/12	25.00
More than two	2/78	2.56	1/12	8.33
Total	40/78	51.28	8/12	66.66

Nonspecific ECG abnormalities were analyzed. Out of 90 cases, there were 70 (77.78%) of T wave, 15 (16.67%) of ST wave and 5 (5.55%) of ST and T abnormalities (Table - 2).

Mean age : 38 years. Range (25 - 55.8 years) Mean age for nonspecific ECG abnormalities was found to be 38 years and range 25 to 55 years. The maximum incidence (66.66%) was found in age group of 31 to 40 years (Table - 3)

Out of 90 cases, 70 (77.78%) remained nonspecific with out any significant alternation, 8 8.89%) reverted back to normal and 12 (13.33)%) progressed to changes diagnostic of Coronary artery diseases (Table-4). Relationship of nonspecific ST/T changes and coronary risk factors eg. DM. Hypertension, Smoking, Obesity and Hyperlipidemia etc was analysed. 66.66% of ±ose which progressed to specific ECG changes ***o f*** coronary artery disease, had one or more coronary risk factors compared to 51.28% in those *hose abnormalities disappeared or persisted unchanged (Table-5)

Discussion

ECG recording (Resting & DMT) is being used as standard screening procedure for detection of coronary artery disease amongst aircrew. These ECG which are periodically taken amongst asymptomatic aircrew, often reveal certain borderline ST segment and / or T wave abnormalities which do not fulfil the criteria for coronary artery disease even after stress testing. These ECG changes are labelled nonspecific [1, 2] in the absence of any causative factor.

In this study, T wave abnormality was found to be the most common nonspecific abnormality. Similar findings are reported from earlier studies. [3, 4] Incidence of nonspecific ECG abnormality was found to be more in younger age group (31 - 40 years). It is because of ECG recording every alternate year after completion of 30 years of age and every year after 40 years amongst defence aircrew. [1] It was observed that 86.67% nonspecific ST and / or T wave abnormalities either reverted

to normal (8.89%) or remained nonspecific (77.78%). Packard [5] classified 90 ECGs as " borderline". He observed that 59 of these reverted back to normal and 31 remained unchanged, suggesting that majority of borderline abnormalities are innocent. Various studies have revealed that these cases with nonspecific ECG abnormality have 3 to 6 times [6] the risk of developing coronary artery disease than those with normal ECGs. In this study 13.33% cases of nonspecific ECG abnormality developed coronary artery disease during follow up. Incidence of coronary artery disease has been found more in those having coronary risk factors. In our study also, 66.66% cases who later developed coronary artery disease were found to have had one or more coronary risk factors as compared to 51.28% in those where abnormality disappeared or persisted unchanged.

Thus, it appears that nonspecific ECG abnormalities should not always be considered benign [6, 2]. On the other hand these do not always represent coronary artery disease in an individual [2]. Such cases need to be assessed from all aspects with special reference to history, clinical examination, coronary risk factors and stress test. In doubtful cases, coronary arteriography should be done. In view of unpredictability and potential for sudden incapacitation in air arising out of undetected progression, nonspecific ST/T abnormalities do pose a problem in aeromedical evaluation as to immediate disposal and long term prognosis. Hence long term surveillance along with measures to correct or prevent coronary risk factors is recommended amongst aircrew with nonspecific ST/T abnormalities.

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