Research Article

Incidence and pattern of E C G abnormalities in patients with cerebrovascular accidents

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Abstract

Introduction: Acute cerebrovascular accidents (C.V.A.) are quite often accompanied with characteristic electrocardiographic (E.C.G.) abnormalities. The findings may be summarised as: Prolongation of the Q-Tc interval and a large and wide T or T-U wave of the same general configuration as in myocardial ischaemia. **Aims and objectives:** To determine the incidence and pattern of E.C.G abnormalities in patients with Cerebrovascular accidents. **Material and method:** All he patients with cebrovascular accidents were included in the study. The study population consisted of 22 cases of cerebral infraction, 22 cases of cerebral haemorrhage and 14 cases of subarachnoid haemorrhage. A 12 lead ECG was taken on the day of admission in all patients and the finding were noted. **Results:** 77.59% patients showed abnormal ECG in the study. It was observed that 20.68% of the study patients demonstrated ST segment changes. Patients with cerebral hemorrhage showed the highest percentages of T wave changes. Q-Tc prolongation was seen in 39.66% of the study patients. Only 4.55% of patients with cerebral infarction and 9.09% with cerebral hemorrhage had pathological Q waves in E.C.G. 31.82% of patients with cerebral hemorrhage demonstrated rhythm disturbances. **Conclusion:** Incidence of abnormal ECG pattern in patients with cerebrovascular accidents was 77.59%. E.C.G. abnormalities were most commonly seen in subarachnoid (93%) and intracerebral haemorrhage (91%). The changes were less often seen in cerebral infarction (55%). ST segment and T wave changes were most commonly found in patients

Keywords: ECG, cerebrovascular accidents.

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INTRODUCTION

Cerebrovascular accidents may be associated with a grossly abnormal electrocardiogram, even in patients without heart disease. The pattern of E.C.G abnormalities is such that if the association is not recognized and erroneous diagnosis of organic heart disease, electrolyte imbalance or drug effect is often made. [1,2] The first account of large upright T wave in the E.C.G in CVA was published by Byer *et al*[3] in 1947 and it was suggested that the abnormality was due to damage to subendocardial myocardium. However, it was not until 1953 when Levine[4] described the abnormal E.C.G. in a patient with SAH and in 1954 when Burch *et al*[2] described a new E.C.G. pattern in CVA consisting of T wave changes, prolongation of QT interval and large U waves and the association was considered significant. In 1960 Schuster[5] described the E.C.G. pattern in patients with SAH. He laid emphasis on the frequency of bradycardia, sinus arrhythmia and short QT interval in contrast to the large interval in most other papers. The morbid anatomy of the heart was normal in most of his patients. Surgical intervention may be postponed or an unduly grave prognosis given if it is wrongly believed that E.C.G. always indicates myocardial ischemia. Unnecessary treatment for myocardial ischemia may also be started in patients whose E.C.G. changes are assumed to be due to associated ischemic heart disease. It is thereby important to recognize E.C.G. abnormalities that may represent purely neurologic disease as well as include cardiac pathology that may be a part of the neurophysiologic disease process.[6,7]

AIMS AND OBJECTIVES

To determine the incidence and pattern of E.C.G abnormalities in patients with Cerebrovascular accidents.

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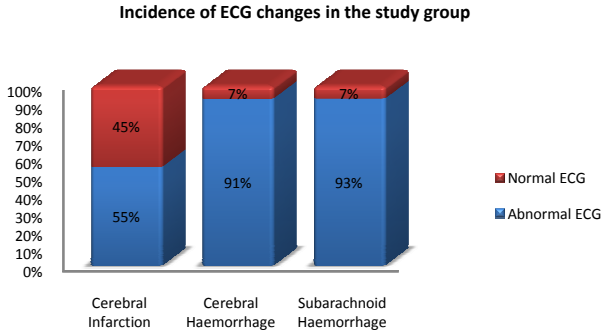
MATERIAL AND METHOD

The present cross sectional study was conducted in the Department of General Medicine, Aarupadai Veedu Medical College Hospital, Pondicherry during 2011-2013. All the patients with cerebrovascular accidents were included in the study, except patients with past history of cardiac disease or known hepatic or renal disorder or on drugs like Digitalis and antidepressants. Thus a total 58 cases of cerebrovascular accidents were recorded during the study duration. Out of total 58 cases 22 consisted of cerebral infraction, 22 cases of cerebral haemorrhage and 14 cases of subarachnoid haemorrhage. Recording of detail history was done and Initial assessment included Serum electrolytes, blood urea and sugar estimation. A CT scan was taken within 48-72 hours after admission in all the patients. The diagnosis of infarction, haemorrhage and subarachnoid haemorrhage was made on the basis of the CT scan. A 12 lead ECG was taken in each individual at a paper speed of 25 mm per second. Adequate precautions were taken to eliminate the external disturbances. From these tracings were obtained the rate, PR interval, QRS interval and QT interval. The Q-Tc interval was calculated according to Bazzett's formula. The P wave amplitude, pathological Q waves, ST segment changes, T wave Changes and U waves were noted from these tracings.

RESULTS

Table 1: Incidence of ECG changes in the study group

Study Group	Abnormal ECG	Normal ECG	No. of Cases
Cerebral Infarction	12 (55%)	10 (45%)	22 (100%)
Cerebral Haemorrhage	20 (91%)	02 (07%)	22 (100%)
Subarachnoid Haemorrhage	13 (93%)	01 (07%)	14 (100%)
Total	**45 (77.59%)**	**13 (22.41%)**	**58 (100%)**



It was observed that out of 22 patients with cerebral infraction 12 (55%) were having abnormal changes in ECG. 20 (91%) out of 22 patients showed abnormal ECG in Cerebral Hemorrhage. 93% of patients with subarachnoid hemorrhage had abnormal ECG findings.

Table 2: Distribution of patients according to various ECG changes

		Cerebral Infarction (n=22)	Cerebral Haemorrhage (n=22)	Subarachnoid Haemorrhage (n=14)	Total
ST segment changes	ST Segment Elevation	0 (0%)	5 (22.73%)	1 (7.14%)	6 (10.34%)
	ST Segment Depression	3 (13.64%)	2 (9.09%)	1 (7.14%)	6 (10.34%)
T wave changes	T Wave Inversion	1 (4.55%)	9 (40.91%)	3 (21.43%)	13 (22.41%)
	Tall T wave	2 (9.09%)	7 (31.82%)	2 (14.29%)	11 (18.97%)
Prolonged Q-Tc interval		10 (45.45%)	7 (31.82%)	6 (42.86%)	23 (39.66%)
Pathological Q waves		1 (4.55%)	2 (9.09%)	0 (0.00%)	3 (5.17%)
Abnormal U waves		0 (0.00%)	2 (9.09%)	1 (7.14%)	3 (5.17%)

It was observed that 20.68% of the study patients demonstrated ST segment changes in the form of elevation or depression of the ST Segment. In patients with cerebral hemorrhage (31.82%) ST segment changes were most commonly seen. Patients with cerebral hemorrhage showed the highest percentages of T wave changes. Overall 18.97% of patients had tall T wave and 22.41% had T wave inversion. The highest incidence of Q-Tc prolongation was seen in patients with cerebral infarction (46%). Q-Tc prolongation was seen in 39.66% of the study patients. Only 4.55% of patients with cerebral infarction and 9.09% with cerebral hemorrhage had pathological Q waves in E.C.G. From the above table it is seen that the incidence of U wave is very low (5.17%).

Table 3: Incidence of with rhythm disturbances in the study population

Rhythm disturbances	Cerebral Infarction (n=22)	Cerebral Haemorrhage (n=22)	Subarachnoid Haemorrhage (n=14)	Total
Sinus Tachycardia	3 (13.64%)	5 (22.73%)	2 (14.29%)	10 (17.24%)
Sinus Bradycardia	0 (0.00%)	2 (9.09%)	0 (0.00%)	2 (3.45%)

31.82% of patients with cerebral hemorrhage demonstrated rhythm disturbances in the form of sinus tachycardia and sinus bradycardia. Overall 20.69% of the study group demonstrated Rhythm disturbances.

DISCUSSION

In the present study we studied the incidence and pattern of E.C.G abnormalities in patients with cerebrovascular accidents. It was observed that abnormal ECG findings were present in 93% cases of subarachnoid hemorrhage, 91% of patients with cerebral hemorrhage and 55% of patients with cerebral infarction. Our findings were consistent with the studies of Arruda and Leacerda[8], who reported incidence of ECG abnormality in 100% patients with subarachnoid haemorrhage whereas 93% of patients with cerebral haemorrhage had an abnormal ECG. ST segment and T wave changes were most commonly found in patients with cerebral haemorrhage (59%) it was followed by an incidence of 43% in patients with subarachnoid haemorrhage and 14% in patients with cerebral infarction. These findings are consistent with the study by Fentz and Formsen[9] who reported an incidence of 71% in cerebral hemorrhage and 15% in cerebral infarction with ST and T wave changes. However in contrary to our findings Kreus *et al*[10] who reported an incidence of ST segment and T wave change in 71% of patients with subarachnoid hemorrhage and 51% of patients with intracerebral hemorrhage. Tall T waves were observed in 18.97% of the patients. Similar findings were observed by Byer *et al*[3] and Burch *et al*[2]. 22.41% of our patients had inverted T wave. Cropp and Monning[11] and Hugenholtz[12] described T wave inversion in patients with no underlying cardiac disease. It was observed that prolongation of Q-Tc interval was present in 39.66%. The highest incidence of Q-Tc prolongation was found in cerebral infarction (45.45%) followed by subarachnoid hemorrhage (42.86%) and cerebral hemorrhage (31.82%). Arruda and Lacerda[8] in their study found prolongation of the Q-Tc interval to be the commonest abnormality in patients with C.V.A. They found that 67% of patients with intracerebral hemorrhage and 53% of subarachnoid hemorrhage patients had prolongation of Q-Tc interval. Abnormal U waves were seen in only 2 cases of cerebral hemorrhage and 1 case of subarachnoid hemorrhage. Our finding was inconsistent with the findings of Hugenholtz and Burch *et al*[2]. A high incidence of rhythm disturbance was noticed in our patients. 20.69% of the study group had either sinus bradycardia or sinus tachycardia. Grossmon[13] in 1976 and Keller *et al*[14] in 1993 had stressed that rhythm disturbances were frequently found in patients with C.V.A. We did not find tall P wave, PR interval prologation or shortening which have been demonstrated in some of the studies.

CONCLUSION

Incidence of abnormal ECG pattern in patients with cerebrovascular accidents was 77.59%. E.C.G. abnormalities were most commonly seen in subarachnoid (93%) and intracerebral haemorrhage (91%). The changes were less often seen in cerebral infarction (55%). ST segment and T wave changes were most commonly found in patients.

REFERENCES

1. Beard, E. F., Robertson, J. W. and Robertson, R. C. L.: Spontaneous subarachnoid haemorrhage simulating acute myocardial infarction. Amer. Heart J.1959; 58: 755-759
2. Burch, G. E., Meyers, R. and Abildskov, J. A.: A new electrocardiographic pattern observed in cerebrovascular accidents. Circulation. 1954; 9: 719-723.
3. Byer E, Ashman and Toth LA: ECG with large upright T waves and long QT intervals American Heart Journal 33:769, 1947.
4. Levine – American Journal of Medicine 15; 344, 1953.
5. Schuster – ECG in subarachnoid haemorrhage. British Heart Journal 22; 316, 1960.
6. Chhetri, M. K. and De, B.: Electrocardiographic changes in cerebrovascular accidents (Role of vagal hyperactivity and intracranial hypertension). Ind. Heart J., 17: 347-351, 1965.
7. Koskelo, P., Punsar, S. and Sipila, W.: Subendocardial haemorrhage and E.C.G. changes in intracranial bleeding. Brit. Med. J., 1: 1479-1480,1964
8. Arruda WO, de Lacerda Junior FS. Electrocardiographic findings in acute cerebrovascular hemorrhage: a prospective study of 70 patients. Arq Neuropsiquiatr. 1992; 50:269-274.
9. Fentz V and Formsen – ECG patterns in Patients with CVA. Circulation 25:22, 1962.
10. Kreus Kemila and Takala : ECG changes in CVA Acto Med Second 185, 327 1969,
11. Cropp GJ and Monning: ECG changes simulating myocardial ischemia and infarction associated with spontaneous intracranial haemorrhage. Circulation 22:25-38, 1960.
12. Hugenholtz; ECG changes after radical neck dissection. American Heart Journal 74; 438, 1967.
13. Gussak, Terrance and Egan – ECG Phenomenon called the J wave Journal of Electrocardiology, Vol.28, 1995.
14. Keller and Williams Cardiac arrhythmias associated with CNS dysfunction; Journal of Neuroscience 25© 349-55; 1993.

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