Original Research Article

Study of electrocardiographic changes in acute cerebrovascular accidents in elderly patients in a tertiary care hospital

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Abstract

Background: Stroke is an important contributor to morbidity, mortality and disability across the globe. The prevalence of stroke appears to be comparatively less in India but it is likely to increase. The proportion of stroke in the young population is significantly more in India than in developed countries. Cardiovascular effects of strokes are often modulated by concomitant or pre-existent cardiac diseases, and are also related to the type of cerebrovascular disease and its localization. **Objectives:** To study the electrocardiographic changes observed in different types of cerebrovascular accident and the prevalence of ECG changes in different types of cerebrovascular accident and to establish the prognostic significance. **Materials and Methods:** This study was the prospective study of 100 subjects with the diagnosis of cerebrovascular accidents. The subjects who had no evidence of prior cardiac abnormalities, no prior history of stroke or reasons for electrolyte effect abnormalities on their electrocardiograms were included. **Investigations:** Complete blood picture, ECG, Serum electrolytesetc. **Results:** The cerebrovascular accidents increases with age with 25% in the age group of <60 yrs and 45% above 70yrs. Cerebral thrombosis formed the largest group in the study comprising 54% of cases. Fifty four patients were known hypertensive. It is seen that in the 100 cases studies 81 cases had some abnormality in the ECG which was more common in patients of cerebral haemorrhage. The most common ECG abnormality associated with stroke was T wave changes (44%).T wave changes were more frequent in cerebral haemorrhage. Q-Tc prolongation occurred more frequently in patients with cerebral hemorrhage. ST segment changes were more frequent in cerebral hemorrhage. Overall immediate mortality was higher in cerebral hemorrhage (51.6%).The highest mortality was seen in comatose patients (50%). **Conclusion:** The ECG changes were common in hemorrhage than in infarcts. These changes were presumed to be due to alterations in sympathetic andparasympathetic tone. The mortality in these patients did not relate to the ECG changes seen but was dependent on the type of CVA and the level of consciousness on admission. Atrial fibrillation was more frequent in ischemic stroke than in hemorrhagic stroke. ST depression and Q waves, suggesting that these ECG changes may indicate coexisting ischaemic heart disease.

Key Words: acute cerebrovascular accidents.

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INTRODUCTION

The term "stroke" (syn: apoplexy) is applied to acute severe manifestations of cerebrovascular disease(CVD). A stroke is the rapidly developing loss of brain function(s) due to a disturbance in the blood supply to the brain[1]. This can be due to ischemia (lack of blood supply) caused by thrombosis or embolism or due to a hemorrhage. It makes an important contribution to morbidity, mortality and disability in developed as well as developing countries. Although there are substantial differences from place to place, thrombosis is the most

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frequent cause, followed by haemorrhage[1]. In 2008 it was estimated that CVD accounted for 6.1 million deaths worldwide, equal to 10.8 % of all deaths. Majority of these deaths occurred in people living in developing countries and 33.72% of the subjects were aged less than 70 years. In addition, CVD is the leading cause of disability in adults and each year millions of stroke survivors have to adopt life with restriction in activities of daily living as a consequence of stroke. Many surviving stroke patients will often depend on other people's continuous support to live.[2] Stroke patients are at highest risk of death in the first weeks after the event, and between 20-50 per cent die within first month depending on type, severity, age, co-morbidity and effectiveness of treatment of complications. Patients who survive may be left with no disability or with mild, moderate or severe disability. Considerable spontaneous recovery occurs upto about 6 months. However, patients with history of stroke are at high risk of a subsequent event of around 10 per cent in the first year and 5 per cent year thereafter.[3] Although the prevalence of stroke appears to be comparatively less in India than in developed countries, it is likely to increase proportionally with the increase in life expectancy. The proportion of stroke in the young population is significantly more in India than in developed countries; more important causes for this are rheumatic heart disease, ischaemic strokes in peripartum period and arteriopathies as a sequale of CNS infections like bacterial and tubercular meningitis etc.[4] The prevalence rate of stroke in India is about 1.54 per thousand and death rate about 0.6 per 1000. The DALYs lost is about 597.6 per lac.[4] The total number of stroke cases in India in the year 2004 were about 9.30 million with about 0.63 million deaths, and total DALYs lost in 2004 were about 6.36 million.[5] Stroke could soon be the most common cause of death worldwide. Stroke is currently the second leading cause of death in the Western world, ranking after heart disease and before cancer, and causes 10% of deaths worldwide. The incidence of stroke increases exponentially from 30 years of age, and etiology varies by age. 95% of strokes occur in people age 45 and older, and two-thirds of strokes occur in those over the age of 65. Stroke can occur at any age. Usually incidence rates rise steeply with age. Globally about 47 per cent of all stroke deaths occur in persons over 70 years. In India, about one-fifth of all strokes occur below the age of 40. This is attributed to our "young population", and shorter life expectancy. Family members may have a genetic tendency for stroke or share a lifestyle that contributes to stroke. Higher levels of Von Willebrand factor are more common amongst people who have had ischemic stroke for the first time. Men are 1.25 times more likely to suffer strokes than women, yet 60% of deaths from stroke occur in women. Since women live longer, they are older on average when they have their strokes and thus more often killed (NIMH 2002). Some risk factors for stroke apply only to women. Primary among these are pregnancy, childbirth, menopause and the treatment thereof (Hormone Replacement Therapy). Electrocardiographic (ECG) changes are reported frequently after acute strokes. It seems that cardiovascular effects of strokes are modulated by concomitant or pre-existent cardiac diseases, and are also related to the type of cerebrovascular disease and its localization. The study was aimed to determine the pattern of ECG changes associated with pathophysiologic categories of acute stroke among patients with/without cardiovascular disease and to determine if specific ECG changes are related to the location of the lesion.

MATERIALS AND METHODS

The material for the present prospective study of 100 subjects admitted through casualty /OPD of Dr. Shankarrao Chavhan Government Medical college and Hospital, Vishnupuri, Nanded. With the diagnosis of cerebrovascular accidents in the patients, detailed clinical history of the cases was studied and the same was recorded with special focuss on particular reference to the Central nervous system and the cardiovascular system. Eliminating any patient from the study with evidence of previous ischemic heart disease, congenital, valvular or cardiomyopathic heart disease. However patients with hypertension/diabetes mellitus were included in the study. Electrolyte, profiles were a requisite and all patients with electrolyte imbalance excluded from the study. 100 subjects with CVA who had no evidence of prior cardiac abnormalities, no prior history of stroke or reasons for electrolyte effect abnormalities on their electrocardiograms were included. A thorough physical examination was done with special emphasis to the nervous system and cardiovascular system examination. Examination also included vital signs especially blood pressure changes, peripheral pulses including the carotid and evidence for atherosclerosis.

Investigations done included: Complete blood picture, Urine examination, ECG, Blood urea, Serum creatinine, Serum electrolytes, Lipid profile, Chest X – rayetc. Cardiac enzymes were done in some patients where there was a suspicious of myocardial infarction. Serum VDRL was done in relevant cases. CT scan of the head was done in all cases. Lumbar puncture was done only in those cases where it was essential for diagnosis. 2D ECHO cardiograms were done in few cases where there was suspicion of heart disease. 12 lead ECG was taken for all cases as soon as the patient was admitted. A repeat ECG

was done 3-5 days later in all patients who survived. Patients were assigned to one of the following types of cerebrovascular accident. Cerebral thrombosis, Cerebral embolism, Cerebral haemorrhage, Subarachnoid haemorrhage.

OBSERVATION AND RESULTS

Table 1: Age and sex distribution

Age group	Male	Female	Total
<60 yrs	14	11	25
61-70	17	13	30
>70	23	22	45
Total	**54**	**46**	**100**

Table 2: Showing the incidence of different types of stroke

Type of stroke	No. of cases	%
Cerebral thrombosis	54	54
Cerebral haemorrhage	29	29
Subarachnoid haemorrhage	07	7
Cerebral embolism	10	10

Table 3: Showing incidence of reactive hypertension immediately after stroke

Patient	Before stroke	After Stroke	
		High	Normal
Hypertensive	58	48	10
Non hypertensive	42	17	25
Total	**100**	**65**	**35**

Table 4: Electrocardiographic abnormalities in different types of stroke

Type of stroke	Normal	Abnormal	Total	% of abnormal
Cerebral thrombosis	14	40	54	74.07
Cerebral haemorrhage	1	28	29	95.6
Subarachanoid haemorrhage	1	6	7	85.7
Cerebral embolism	3	7	10	70
Total	**19**	**81**	**100**	**81**

Table 5: Showing specific ECG changes in different types of stroke

ECG change	CT	CH	SAH	CE	Total	%
Q- Tc prolongation	15	14	1	2	32	32
ST segment changes	6	17	3	2	28	28
T wave changes	9	23	5	7	44	44
U waves	0	7	4	0	11	11
Q waves	3	0	0	0	3	3
LVH	17	19	2	1	39	39
Sinus arrhythmia	0	3	0	0	3	3
Sinus tachycardia	13	12	2	1	28	28
Sinus bradycardia	6	5	0	0	11	11
Atrial fibrillation	2	0	0	2	4	4
Vent. premature beats	2	0	0	0	2	2
LBBB	0	2	0	0	2	2
RBBB	2	0	0	0	2	2
P Pulmonale	0	4	2	0	6	6
Normal	13	1	1	3	18	18

Table 6: Showing immediate mortality in different types of CVA

Types of CVA	Total Patients	Patients Expired	%
Cerebral thrombosis	54	2	3.7
Cerebral haemorrhage	29	16	51.7
Subarachnoid haemorrhage	7	2	28.5
Cerebral embolism	10	2	20
Total	**100**	**22**	**22**

Table 7: Showing relation of level of consciousness to immediate mortality

Level of consciousness	Expired	Total Patients	Percentage
Alert	2	38	5.26
Drowsy	10	42	23.8
Stuporous/Comatose	10	20	50
Total	**22**	**100**	**22**

Hundred patients admitted with stroke were studied in detail and following observations were noted. Out of 100 study participants 54 were males and rest 46 were females. (Table 1) The cerebrovascular accidents increases with age with 25% in the age group of <60 yrs and 45% above 70yrs. The youngest patient with CVA was 48yrs and the oldest was 85yrs old. (Table 1) Cerebral thrombosis formed the largest group in the study comprising 54% of cases. The next common type of stroke was cerebral haemorrhage comprising 29% of cases. Subarachnoid haemorrhage (7%) and cerebral embolism constituted 10%. (Table 2) Fifty four patients were known hypertensive. 48 of them showed high blood pressure on admission and 10 of them had normal recording on admission. However among the non hypertensive 17 patients (40.47%) had a reactive hypertension whereas 27 patients (59.53%) had normal blood pressure. (Table 3) It is seen that in the 100 cases studies 19 cases had a normal ECG (19%) while 81 cases (81%) had some abnormality in the ECG. As evident from the above table ECG changes are more common in cerebral haemorrhage and subarachnoid haemorrhage than in infarcts. (Table 4) The most common ECG abnormality associated with stroke was T wave changes (44%) followed by left ventricular hypertrophy pattern with or without strain (39%) prolonged Q-Tc interval (32%). ST segment changes (28%), sinus tachycardia (28%), sinus bradycardia (11%) and U waves (11%) (Table 5) T wave changes were more frequent in cerebral haemorrhage. 39% of patients showed left ventricular hypertrophy pattern (by voltage criteria) with or without strain pattern. All of them were hypertensive. Q-Tc prolongation occurred more frequently in patients with cerebral haemorrhage (i.e. 15 out of the 32 patients = 47.6 %) and cerebral thrombosis (14 out of 32 patients = 43%). ST segment changes were seen In 28% of patients. 20 of them had ST segment depression and 8 of them had ST segment elevation. ST segment changes were more

frequent in cerebral haemorrhage (17 out of 28 patients i.e. 60.7%) and cerebral thrombosis (6 out of 28 patients i.e. 21.4%). Three of cases of SAH and a case of cerebral haemorrhage where the EGG showed ST segment changes. Among the arrhythmias, sinus tachycardia was seen in 28% of cases, sinus bradycardia in 11% cases, atrial fibrillation in 4%cases and sinus arrhythmia in 3% of cases. There were U waves seen in 11% of cases. They occurred more frequently in patients with cerebral haemorrhage and subarachnoid haemorrhage (7% and 4% respectively) Other abnormalities that were seen in EGG were P. Pulmonale (6%), Ventricular premature beats (2%), right bundle branch block (2%), left bundle branch fascicular block (2%) and Q waves (2%). (Table 5) Overall immediate mortality was 22%. It was high in cerebral haemorrhage (51.6%) followed by subarachnoid haemorrhage (28.36%) and cerebral embolism (20%). 3.7% of patients with cerebral thrombosis expired. (Table 6) The highest mortality was seen in comatose patients (50%) and least in alert patients (5.26%). An attempt was made to correlate the mortality in these patients with the ECG changes. It was found that the mortality in these patients did not relate to the ECG changes seen but was dependent on the level of consciousness on admission, the type of cerebrovascular accident, the extent of the lesion and other Co-existant disease. (Table 7)

DISCUSSION

The ECG changes In CVA is known. The incidence of ECG changes is higher with intracerebral hemorrhage and subarachnoid hemorrhage than with cerebral infarcts. Kaya, McDonald and Randall have demonstrated subendocardial hemorrhages after prolonged and intense sympathetic activity on the heart such a condition of intense sympathetic drive may occur during an acute cerebrovascular accident. However acute myocardial damage is unusual.[6,7] Direct stimulation of various areas of the brain is known to result in abnormal electrical pattern of the heart. Gropp and Manning[8] have suggested that lesion of area 13 on the orbital surface of the frontal lobe may be responsible for the EGG changes. It is therefore proposed that the cause of EGG abnormalities in association with lesions in the vicinity of area 13 on the orbital surface of the frontal lobe or around the circle of Willis, results from alteration in sympathetic and parasympathetic tone mediated by fibres from the orbito frontal area to the heart via the stellate ganglion. In the present study all the 50 patients with stroke were studied for EGG changes on admission. Some of the cases had serial ECG's done. The changes observed were attributed to stroke after ruling out other possible factors like electrolyte disturbances. In the present study 18% had normal ECG and the remaining 82% showed some ECG changes. Q- Tc prolongation which comprised 30% in the present study was reported as a frequent finding in studies by Goldstein[9] (1979), Fentz[10] (1962), Mathur[11] (1966) Mayo Clinic[12] (2009) etc. Goldstein 1979[9]ECG findings were normal 8, abnormal 92, QTc prolongations 45, Twaves 29, U waves 28, ST changes 27, sinus tachycardia 28, LVH 26, Sinus bradycardia 7, Atrial fibrillation 14, Q waves 20. This was found to be more frequent in patients with intracranial hemorrhage (41 %) compared to other types of stroke. Similar observations were also described by Goldstein[9]. T wave changes in 20 of cases in comparison to 44% of cases in the present study. T wave changes were more frequent in cerebral hemorrhage. Similar T wave changes were described by Fentz[10] (1962), Mathur[11] (1966), Ananthachari[12] (1967), Fure B (2006)[13]etc. U wave seen in 10% of case's in comparison to 28% of cases in the study done by Goldstein. They were more common in subarachnoid haemorrhage (33%) and intracerebralhaemorrhage (18%). ST depression was found in 20% of cases against 27% of cases in the study done by Goldstein. The other findings seen in the present study has been described by various authors in variable frequency. Negh KH (2004)[14]The ECG rhythms and ischemic changes of 97 elderly patients admittedwith acute stroke or transient ischemic attack (TIA) were compared with those of 70 medical controls admitted during the same study period. Patient's median age was 80 years. Atrial fibrillation occurred in 26 stroke/TIA patients (27%) and 17 control patients (24%). Ischemic ECG changes occurred in 54 stroke/TIA patients (56%) and 32 control patients (46%). Fure B (2006)[13]the aims of the study were to assess the prevalence of ECGchanges in acute ischemic stroke, a total of 279 patients suffering from acute ischemic stroke were included prospectively in the study the most frequent ECG changes were, prolonged QT_c 36%, ST depression 24.5%, atrial fibrillation 19.9% and T wave inversion 17.8%. In the present study findings are 100 patients, among them 54 were male and 46 were female. The incidence of stroke in the age group below 60 years was 25% and in the age group above 61-70 years was 30% and in the age group above 70 yrs was 45%. Among these 54 patients (54%) were Cerebral Thrombosis type, 29 patients (29%) were cerebral hemorrhagic type, 7 patients (7%) were of subarachnoid type and 10 patients (10%) Cerebral embolism type. Among 100 patients 58 were hypertensive, 28 were Diabetes mellitus patients. In 100 cases studied 19 cases had normal ECG (19%), while 81 cases (81%) had some abnormality in the ECG. These abnormalities were commonly seen in cerebral hemorrhage and subarachnoid hemorrhage than infarcts (more than 95% and 85% respectively). The ECG changes were QTc prolongation (32%), ST Segment

changes (28%), T wave changes (44%), U wave changes (11%), LVH (39%), sinus tachycardia (28%), sinus bradycardia (11%), Normal (18%), a wave (2%), sinus arrhythmia (3%), VPC (2%), LBBB (2%), RBBB (2%), P pulmonale (6%), Atrial fibrillation has found in (4%) of the patients. The overall immediate mortality was 22%. It was 51.7% in Cerebral hemorrhage, 28.5% in SAH, 20% in cerebral embolism and 3.7% was in cerebral thrombosis. These findings were similar to the Bozluolcay M (2003), Negh KH (2004), Fure B,(2006) above mentioned studies[14]. The Goldstein D.S.[9] study and the present study revealed that the immediate mortality was higher as the level of consciousness deteriorated, i. e. it was highest in stuporous or comatose patients and least in the alert and conscious patients.

CONCLUSION

Patients with CVA frequently had abnormal ECG in the absence of known organic heart disease or electrolyte imbalance. These ECG changes were more common in intracerebral haemorrhage and subarachnoid haemorrhage than in infarcts. The common EGG changes were T wave changes, prolonged QTc, ST segment changes and arrhythmias. These changes were presumed to be due to alterations in sympathetic and parasympathetic tone. The mortality in these patients did not relate to the ECG changes seen but was dependent on the type of CVA and the level of consciousness on admission. ECG changes were prevalent in acute ischaemic stroke. Atrial fibrillation was more frequent in ischemic stroke than in hemorrhagic stroke. ST depression and Q waves, suggesting that these ECG changes may indicate coexisting ischaemic heart disease. Regardless stroke-related lesion, ECG abnormalities were seen frequently in stroke patients without primary heart disease. They lead to diagnostic and therapeutic difficulties. Patients with acute ischaemic stroke require adequate treatment and preferably a follow-up with focus on cardiologic as well as neurological aspects.

REFERENCES

1. K Park, 23rd edition, Non Communicable Disease, Stroke; p 328-333.
2. Disease and Injuries, Regional estimates, cause specific mortality, Estimates-2008; WHO 2011
3. Truelse T, Global burden of Cerbrouascular Disease; WHO (2011).
4. Assessment of Burden of Non-Communicable Diseases, Final Report; ICMR (2004).
5. National Health Profile 2011, Ministry of Health and Family Welfare, Govt. of India (2011), New Delhi.
6. Kaya M. P. et al: Systolic hypertension and subendocardial hemorrhage produced by electrical stimulation of the stellate ganglion. Circulation Research, 1961; 9:1164.
7. McDermott M.M. et al: ST segment depression detected by continuous electrocardiography in patients with acute ischemic stroke or Transient ischemic attack, Sep.1994; 25(9): 1820-4.
8. Cropp G.H. and Manning G.N.: ECG changes simulating myocardial ischemia and infarction associated with spontaneous intracerebral hemorrhage. Circulation, 1960; 12:25.
9. Goldstein O.S.: ECG in stroke. Stroke, 1979; 10,3 : 253. Greenhoot G.J. et al: Cardiac injury and subarachnoid hemorrhage. A clinical, pathological and physiological correlation. J. Neurosurgery, 1969; 30:521.
10. Fentz et al, ECG pattern in patients with cerebrovascular accidents. Circulation, 1962; 25: 22.
11. Mathur K.S. et al: ECG abnormalities associated with cerebrovascular accidents. J. Ind. Med. Assoc, 1966; 46: 11, 6: 599.
12. Ananthachari M.D. and Anto C.D.: A study of ECG changes in 20 cases of subarachnoid hemorrhage. Indian Heart Journal, 1967; 19 (4): 105.
13. Fure B, BruunWyller T, ThommessenB.Electrocardiographic and troponin T changes in acute ischaemic stroke; J Intern Med. 2006 Jun; 259(6):592-7.
14. Parashuram, S Venkataramanappa, clinical study of electrocardiogram changes in different types of cerebrovascular accidents and prognostic significance; J. Evolution Med. Dent. Sci. / Vol. 05/ Issue 49/ June20, 2016

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