

HEMISPHERIC DISTRIBUTION OF MIDDLE CEREBRAL ARTERY ISCHEMIC STROKES IN PATIENTS ADMITTED TO MILITARY HOSPITAL RAWALPINDI

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ABSTRACT

Objective: To determine the difference in the frequency of middle cerebral artery (MCA) ischemic strokes between left and right cerebral hemispheres in the adult patients admitted to the Military Hospital (MH) Rawalpindi.

Study Design: A descriptive study.

Place and Duration of Study: MH Rawalpindi from 01 Dec 2013 to 30 Mar 2014.

Patients and Methods: Seventy eight adult patients admitted to MH Rawalpindi with neurologic deficits consistent with MCA strokes and having no evidence of intracerebral haemorrhage on Computed Tomographic (CT) scan of brain. Descriptive Statistics were calculated using SPSS version 17.

Results: A total of 78 patients met the inclusion criteria of the study; 35 (45%) patients had right MCA stroke while 43 (55%) had left MCA stroke.

Conclusion: Left MCA ischemic strokes are more common than right MCA ischemic strokes.

Keywords: Ischemic stroke, Left middle cerebral artery, Right middle cerebral artery.

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INTRODUCTION

The stroke is a rapidly developing clinical syndrome of focal and sometimes global loss of brain function lasting more than twenty four hours or leading to death with no apparent cause other than vascular origin¹.

Stroke is the number one cause of major disability and the third most common cause of death in the developed and the developing countries². Stroke mortality rises rapidly with age³. Despite the decline of this disease in developed countries, its burden in South Asian countries has increased⁴. It is estimated that every year about 350,000 new cases of stroke occur in Pakistan⁵. The prevalence of stroke in Pakistan has been reported to be twice the highest reported in the world⁶.

The brain is only 2% of total body weight but receives 20% of the cardiac output,

consuming about 20% of inspired oxygen. This rich blood supply is provided by the two internal carotid and two vertebral arteries which anastomose at the base of the brain to form the circle of Willis. The internal carotid artery (ICA) bifurcates into the anterior cerebral artery and the larger MCA. The MCA supplies the lateral parts of the cerebral hemispheres. Its lenticulostriate branches supply the basal ganglia and internal capsule.

Approximately 80% strokes are due to ischemic cerebral infarction and 20% are due to brain hemorrhage. Among the ischemic strokes 50% involve the anterior circulation, 25 to the posterior circulation and the remaining 25% are lacunar infarcts⁷. Occlusion of the MCA usually results from cardio embolism or proximal atherothrombosis.

Lateralization of MCA strokes is important in post stroke rehabilitation due to functional differences between the two hemispheres. The main purpose of this study was to determine the difference in the frequency of MCA ischemic strokes between left and right cerebral

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Received: 18 Dec 2014; revised received: 26 Feb 2015; accepted: 10 Mar 2015

hemispheres in the adult patients admitted to our hospital.

PATIENTS AND METHODS

This is a descriptive observational study conducted at MH Rawalpindi from 01st Dec 2013 to 30th March 2014. Adult patients consecutively admitted to MH Rawalpindi with clinical features consistent with MCA stroke (table) and no evidence of intracranial hemorrhage in the initial CT scan of brain were included in this study. Patients with clinical features suggestive of transient ischemic attack (TIA), intracranial hemorrhage, lacunar infarcts, bilateral infarcts, multiple infarcts, anterior cerebral artery territory infarcts and posterior circulation strokes were excluded from the study. A total of 78 patients were included in the study through non probability consecutive sampling.

A detailed history was taken at presentation and physical examination was done. In addition to an initial plain CT scan of the brain, to rule out intracranial hemorrhage at presentation, other baseline investigations including ECG, complete blood count, blood sugar, Lipid profile, LFTs, RFTs were carried out. More detailed investigations including Echocardiography, Carotid Doppler studies and in selected cases CT

RESULTS

A total of 78 patients (66 males, 12 females) met the inclusion criteria of the study. Their ages ranged from 32 years to 95 years. A total of 45% patients had right MCA stroke while 55% had left MCA stroke.

Thus left-hemispheric ischemic strokes (55%) were more common than right hemispheric ischemic strokes (45%) in the distribution of MCA in our patients.

DISCUSSION

The consequences of stroke range from physical disability to death and accompanying psychological, social and economic burdens. These consequences not only affect the individual and his family but also have their impact on the whole society. The sequelae of left MCA ischemic strokes differ from those of the right MCA ischemic strokes⁸.

Without any differences in stroke severity and in the volume of the lesions, the outcome of strokes of the right MCA territory has been reported to be less favorable with higher case fatality rates than in controls⁹. Ween et al also reported poor outcome with right hemispheric damage¹⁰. One study showed that patients with

Table: Common clinical features of Middle cerebral artery ischemic strokes.

Common Features (Either MCA)

- Contralateral hemiplegia; upper limb > lower limb
- Contralateral complete hemiplegia if internal capsule involved
- Contralateral hemianaesthesia; upper limb > lower limb
- Homonymous hemianopia.

Dominant hemisphere (Left MCA)

- Aphasia

Non-dominant hemisphere (Right MCA)

- Anosognosia

MCA: Middle cerebral artery

angiography, magnetic resonance imaging (MRI) and magnetic resonance angiography (MRA) of the brain were performed after admission. Data was analyzed using SPSS version 17 and descriptive statistics were used to describe the results.

right hemispheric strokes presented later to an emergency department than the left¹¹. Studies in infants and children suggest that the left hemisphere has greater metabolic demands than the right¹². These asymmetrical hemispheric

metabolic demands may influence neuroplasticity during the post stroke recovery.

It has been found that cerebrovascular disease has a predilection for left side resulting in more frequent left MCA infarctions than infarctions in the territory of the right MCA. The left common carotid artery is a direct branch of the aorta and cardiogenic emboli may prefer left MCA. The hemodynamic differences between the right and left carotid arteries may also result in greater atherosclerotic changes in the left carotid artery leading to more left MCA ischemic strokes¹³.

We aimed to establish whether left and right MCA ischemic strokes are unequally distributed in our patients. In our study population 45% had right MCA strokes while 55% had left MCA strokes. Our results are comparable to data from a large hospital based stroke registry in Germany which revealed that 56% had left MCA events and 44% had right-sided lesions¹⁴. DiLegge et al reported that 59% of their patients had left MCA ischemic strokes while 41% had right MCA events. In their patients right hemispheric stroke had worse clinical outcomes than left hemispheric stroke¹⁵.

Naess et al reported that the patient records of young adults from five hospital registries in western Norway revealed that 58% had left hemisphere infarctions and 42% had right hemisphere infarctions. This difference was due to the higher incidence of infarction in the left MCA territory compared with the right MCA territory¹⁶. Ito et al found that among their department based records of 383 cases between April 2003 and March 2006, 52% patients had left hemispheric stroke and 48% had right hemispheric stroke¹⁷. These comparative data of the most common stroke groups are important in functional prognosis, rehabilitation and healthcare planning¹⁸.

An increase in carotid artery intima-media thickness (IMT) coincides with risk factors such as hypercholesterolemia, hypertension and

diabetes mellitus. It also correlates independently with peripheral atherosclerosis. There exists a difference between IMT of the left and right common carotid artery, with higher values on the left side which may explain predilection for cerebrovascular disease at the left side¹⁹.

Aphasia is a common symptom after left hemisphere stroke. Most of the natural and traditional speech therapy facilitated recovery from aphasia occurs within the first 6 months of a stroke²⁰. The affected individuals often experience incomplete recovery even after receiving intense speech therapy.

CONCLUSION

The incidence of left MCA territory ischemic strokes is higher than the right MCA distribution in our population. Aphasia is a common symptom of left MCA stroke and affected individuals often need intense speech therapy after the acute stroke phase. There is an increasing need to develop new interventions that enhance the recovery from chronic aphasia after a stroke.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

REFERENCES

1. Hatano S. Experience from a multicentre stroke register: a preliminary report. *WHO Bull*, 1976; 54: 541-53.
2. Feigin VL. Stroke epidemiology in the developing world. *Lancet*, 2005; 365: 2160-61.
3. Bonita R, Beaglehole R. Stroke mortality. In 1992 Population based studies of stroke, Whisnant JP (ed), International Medical Review Series, Butterworth, Oxford: 1-30.
4. Bulatao RA, Stefan PW. Global estimates and projections of mortality by cause. Washington DC: population, health & nutrition department; World Bank, pre-working paper, 1992; 1007.
5. Khealani BA, Hameed B, Mapari UU. Stroke in Pakistan. *J Pak Med Assoc*, 2008; 58: 400-3.
6. Kamal A, Itrat A, Murtaza M, Khan M, Rasheed A, Ali A, et al. The burden of stroke and transient ischemic attack in Pakistan: a community-based prevalence study. *BMC Neurology*, 2009; 9: 58.
7. Bamford J, Sandercock P, Dennis M, Burn J, Warlow C. Classification and natural history of clinically identifiable subtypes of cerebral infarction. *Lancet*, 1991; 337: 1521-6.
8. Fink JN, Frampton CM, Lyden P, Lees KR. Virtual International Stroke Trials Archive Investigators. Does hemispheric lateralization influence functional and cardiovascular outcomes

- after stroke?: an analysis of placebo-treated patients from prospective acute stroke trials. *Stroke*, 2008; 39: 3335–3340.
9. Aszalós Z, Barsi P, Vitrai J, Nagy Z. Lateralization as a factor in the prognosis of middle cerebral artery territorial infarct. *Eur Neurol*, 2002; 48: 141-5.
 10. Ween JE, Alexander MP, D'Esposito M, Roberts M. Factors predictive of stroke outcome in a rehabilitation setting. *Neurology*, 1996; 47: 388–392.
 11. DiLegge S, Fang J, Saposnik G, Hachinski V. The impact of lesion side on acute stroke treatment. *Neurology* 2005; 65: 81–86.
 12. Arditi H, Feldman R, Hammerman C, Eidelman AI. Cerebral blood flow velocity asymmetry, neurobehavioral maturation and the cognitive development of premature infants across the first two years. *J Dev Behav Pediatr*, 2007; 28: 362–368.
 13. Folsom AR, Eckfeldt JH, Weitzman S, Ma J, Chambless LE, Barnes RW, et al. Relation of carotid artery wall thickness to diabetes mellitus, fasting glucose and insulin, body size, and physical activity: Atherosclerosis Risk in Communities (ARIC) Study Investigators. *Stroke*, 1994; 25: 66–73.
 14. Foerch C, Misselwitz B, Sitzer M, Berger K, Steinmetz H, Neumann-Haefelin T, et al. Arbeitsgruppe Schlaganfall Hessen. Difference in recognition of right and left hemispheric stroke. *Lancet*. 2005; 366: 392-3.
 15. DiLegge S, Saposnik G, Nilanont Y, Hachinski V. Neglecting the difference: does right or left matter in stroke outcome after thrombolysis? *Stroke* 2006; 37: 2066–2069.
 16. Naess H, Waje-Andreassen U, Thomassen L, Myhr KM. High incidence of infarction in the left cerebral hemisphere among young adults. *J Stroke Cerebrovasc Dis*, 2006; 15: 241–244.
 17. Ito H, Kano O, Ikeda K. Different variables between patients with left and right hemispheric ischemic stroke. *J Stroke Cerebrovasc Dis*, 2008; 17: 35-8.
 18. Ng YS, Stein J, Ning M, Black-Schaffer RM. Comparison of clinical characteristics and functional outcomes of ischemic stroke in different vascular territories. *Stroke* 2007; 38: 2309-14.
 19. Cupini LM, Pasqualetti P, Diomedei M, Vernieri F, Silvestrini M, Rizzato B, et al. Carotid artery intima-media thickness and lacunar versus nonlacunar infarcts. *Stroke*, 2002; 33: 689–694.
 20. Lazar RM, Minzer B, Antoniello D, Festa JR, Krakauer JW, Marshall RS. Improvement in aphasia scores after stroke is well predicted by initial severity. *Stroke* 2010; 41: 1485–1488.
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