

# Occlusive Cerebrovascular Disease in Young Adults

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**ABSTRACT:** This retrospective study documents the experience of two large Canadian teaching hospitals with occlusive cerebrovascular disease in young adults. Chart review disclosed 76 patients aged 15-40 years during a recent six year period. An apparent cause, or significant coincident risk factors were found in 51 patients (67%). The most prevalent recognized causes were atherosclerosis, emboli from cardiac sources or intracranial aneurysms, and complicated migraine. Pregnancies or use of oral contraceptives were apparent coincident risk factors.

**RÉSUMÉ:** La présente étude rétrospective documente l'expérience de deux centres hospitaliers universitaires canadiens en ce qui concerne la maladie cérébro-vasculaire occlusive du jeune adulte. La revue des dossiers a révélé l'existence de 76 patients âgés de 15-40 ans sur une période de 6 ans. Une cause apparente de l'occlusion a été retrouvée chez 51 patients (67%). Les causes les plus importantes furent l'athérosclérose, les embolies d'origine cardiaque, les anéurysmes intracrâniens et la migraine accompagnée. La grossesse ou l'emploi des contraceptifs oraux semblent jouer un rôle coïncidentaire.

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Strokes, reversible ischemic neurological deficits (R.I.N.D.) and transient ischemic attacks (T.I.A.) are common problems in older individuals (Kurtzke, 1969). These events also occur surprisingly often in young adults. Humphrey and Newton (1960) reviewed the literature, and found reports of 107 patients under the age of 40 years with carotid artery occlusion. Since then, there have been at least eight published series from Europe and North America, each reporting more than 40 "young" adults with stroke, R.I.N.D., or T.I.A. There have also been reports from other regions, particularly the Indian subcontinent, where cerebral infarction in young adults may be more common and perhaps has a more varied etiology. (Chopra and Prabhakar, 1979, Dalal, 1979).

## MATERIAL AND METHODS

We reviewed the charts of patients between the ages of 15 and 40 years, admitted to the Foothills or Calgary General Hospitals between January 1st, 1976 and December 31st, 1981, and discharged with a diagnosis of stroke, R.I.N.D. or T.I.A. All patients with neurologic deficits secondary to intracranial tumors, subarachnoid hemorrhage, intracerebral hemorrhage, head or neck trauma or with an obvious cause of severe, sustained, systemic hypotension were excluded. Patients with complicated migraine and no fixed residual neurological deficits were also excluded.

For each case the adequacy of investigation was reviewed. A basic work-up, including a complete blood count (C.B.C.), serum glucose and electrolytes, and antinuclear antibody (A.N.A.) titres, was done in almost every instance. The number of patients who underwent angiography, computerized cranial tomography (C.T. Scan) and echocardiography, and the results of these studies were documented.

## RESULTS

A total of 76 patients who met the above criteria was identified. Of these, 30 were male and 46 were female. Their ages ranged from 16-40 years with a mean age of 29.4 years.

Twelve patients (16%) had angiographic evidence of atherosclerosis at a site appropriate to their symptoms, and atherosclerosis was therefore assumed to be the cause of the occlusive cerebrovascular event. Eleven (14.5%) were believed to have cardiac sources for emboli and four (5%) were thought to have embolised from intracranial aneurysms. Six (8%) had a stroke or R.I.N.D. associated with complicated migraine. Twelve patients were pregnant or taking oral contraceptive pills at the time of their illness, and in seven (15% of the female group) this was apparently the only significant coincident risk factor. Eleven (14.5%) had other causes for their ischemic episodes, and in 25 instances (33%) no cause was identified (Table 1). A total of 56 patients (73.5%) had a CT Scan, 55 (72.5%) had cerebral

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**Table 1: Etiologic Factors for Cerebral Ischemic Events in 76 Young Adults**

CAUSE	NUMBER OF PATIENTS	%
Atherosclerosis	12	16
Embolus from a Cardiac Source	11	14.5
Embolus from Aneurysm	4	5
Complicated Migraine	6	8
Coincident Pregnancy or use of Oral Contraceptives	7	9
Miscellaneous Causes	11	14.5
No Etiology Identified	25	33
TOTAL	76	100

angiography and 44 (58%) underwent echocardiography. Only 23 individuals (30%) had all three tests.

Of 12 patients with atherosclerosis, seven were male and five female. These individuals tended to be at the upper end of the age range for the study with a mean age of 36 years. Almost all had one or more risk factors for atherosclerosis, such as hypertension, diabetes mellitus, hyperlipidemia, obesity or smoking.

Eleven patients had an identified cardiac source for an embolus. Of these, eight had clinical or electrocardiographic evidence of cardiac disease, but three did not. One female died of subacute bacterial endocarditis after a normal cardiac examination and electrocardiogram had been documented by several observers. She had not had an echocardiogram. Two other cardiac lesions were only detected on echocardiography.

Fifty-five patients (72.5%) in this series had cerebral angiograms, and four of these demonstrated intracranial aneurysms. All four aneurysms were in sites appropriate to the cerebral ischemic event, and in no instance was there any other obvious cause. It therefore appeared that these patients had embolised from intracranial aneurysms. All of these patients were female, and all had transient clinical events, although two had infarctions demonstrated on CT Scans. Six patients, again all female, had ischemic events attributed to complicated migraine. Each of these individuals had a history of prior complicated migraine attacks. One was pregnant and another was using oral contraceptives at the time of the ischemic event.

In seven females with no direct discernable cause for an ischemic event, six were using oral contraceptives, and one was pregnant.

A variety of other causes were detected in eleven patients. One patient had systemic lupus erythematosus, and another had Takayasu's Disease. One man with polycythemia rubra vera presented initially with T.I.A.'s. Mechanical causes included a congenital anomaly of intracranial circulation in one patient, and vertebral arterial spasm after chiropractic manipulation in another. A truck driver developed multiple pulmonary emboli and a paradoxical embolus to the brain. There was one case of Moya-Moya disease. Four patients with multiple medical problems had strokes. All of them had coagulopathies complicating other major medical disorders.

A total of 25 individuals had no cause identified for their illness. Of these, two discharged themselves against medical advice before investigation was completed. In the remaining group of 23 patients, angiography was performed in 19 cases,

and CT Scan in 21. Only 16 patients had echocardiography, and all three investigations were carried out on only twelve individuals.

## DISCUSSION

Among the eight recently reported series of young stroke patients, five included patients over 40. Louis and McDowell (1967) and Marshall (1982) considered atherosclerosis to be by far the most common cause for strokes in "young" adults. Other reports (Fogelholm and Aho, 1973; Mettinger and Soderstrom, 1978; Snyder and Ramirez-Lassepas, 1980) suggest that atherosclerosis is an important contributing factor only in males in this age group and all three studies found use of oral contraceptives to be the major important risk factor in females.

Only three series (Grindal et al., 1978; Hindfelt and Nilsson, 1977; Hart and Miller, 1983) were confined to patients 40 years of age or under. In these reviews atherosclerosis was found to be a less common cause of cerebral ischemia. The apparent discrepancy between the five reviews which found atherosclerosis to be an important factor, and the four, including this one, which did not, can be readily explained. Had patients aged 40-55 years been included, our series would certainly have been much larger, and atherosclerosis would probably have been much more common.

Eleven patients in our series had an identifiable cardiac source for an embolus. The importance of a detailed cardiac assessment in young stroke patients is widely recognized by neurologists (Barnett et al., 1980; Knopman et al., 1982) but not universally acknowledged by cardiologists (Bergeron and Shah, 1981; Lovett et al., 1981). In our view, assessment by a cardiologist, electrocardiography and echocardiography are essential components of the investigation of young adults with cerebral ischemic events.

The frequency with which emboli arise from intracranial aneurysms is not known. This was considered to be the cause of the ischemic event of four patients in this series. Stewart et al. (1980) reported four patients with recurrent T.I.A.'s attributed to emboli from aneurysms. Three patients (age 39, 40 and 45) had no further T.I.A.'s following surgical treatment of the aneurysm. A 71-year-old female did not have surgery and continued to have recurrent attacks. Fisher et al. (1980) described seven patients with T.I.A.'s occurring in the territory supplied by a vessel which was the site of the unruptured aneurysm. Wieber et al. (1981) followed 65 patients with 81 unruptured aneurysms for an average of more than eight years. They documented three ischemic events which seemed to be related to the aneurysms.

Complicated migraine was diagnosed as the cause of ischemic events in six patients. In those with a history of prior stereotyped attacks of complicated migraine, this diagnosis is clearly appropriate. In individuals with less definite histories, migraine was not accepted as the probable etiology, unless thorough investigation had excluded other causes.

Seven patients, in whom no other cause could be identified, were either pregnant or using oral contraceptives at the time of the cerebral ischemic event. The relationship between oral contraception and stroke is discussed extensively elsewhere. The largest study, the report of the Collaborative Group for the study of Stroke in Young Women (1973), found that 42.1% of women of childbearing age with thrombotic strokes were using oral contraceptives. The patients in our series may not be

comparable because of geographic factors or the difference in time period. However, there was a surprisingly low incidence of use of oral contraceptives amongst the females in this study.

Eleven patients had a variety of other causes for their illness. These etiologies are as would be anticipated from the comprehensive list provided by Warlow (1979).

We conclude that occlusive cerebrovascular disease is not uncommon in young adults, that oral contraceptive agents are seldom implicated, and that a high yield of identifiable treatable lesions justifies extending conventional screening investigations to include echocardiography and cerebral angiography.

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