

SHORT REPORT

Dissection of the brain supplying arteries over the life span

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Cervical artery dissection (CAD) is being increasingly diagnosed due to improved neuroimaging methods. The mean age of patients with CAD is about 40 years, with a peak between 40 and 45 years of age. Proven data on the incidence of CAD in older patients are missing. Therefore, whether CAD should also be considered as a probable cause of cerebral ischemic events in the elderly was investigated. All consecutive patients referred to our clinic with a diagnosis of cerebral ischemia from January 1999 until June 2000 were thoroughly assessed for the presence of CAD. In addition, the records of all stroke patients treated in our department from January 1995 to December 1998 were analysed retrospectively for a diagnosis of CAD. A total of 34 patients (11 women) had suffered from internal carotid ($n=29$) or vertebral artery ($n=5$) dissection. Their mean (SD) age was 50.3 (14.6) years, with 32.4% being older than 60 years. Clinical presentation of CAD did not differ depending on the patients' age. The results show that CAD is a possible cause of cerebral ischemia in the elderly and thus has also to be considered in the diagnostic investigation in this patient group.

Many papers dealing with dissections of arteries supplying the brain state that CAD is the most likely reason for a cerebral ischemic event in young or middle aged patients.^{1–3} However, proven data on the incidence of CAD in older patients are missing, as these patients are rarely referred to centers using early angiography for intraarterial thrombolysis or special MR diagnostics. This selection bias may cause the incidence of stroke due to arterial dissection to be underestimated, particularly in older patients.⁴ Furthermore, asymptomatic or monosymptomatic dissections are likely to be overlooked.⁵

METHODS

We prospectively screened all patients from January 1999 until July 2000 who were referred to our clinic with a tentative diagnosis of cerebral ischemia. The stroke unit of our department is one of four in our region and, as all community hospitals follow the same standard in stroke treatment, selection bias can be excluded. Screening of the prospective group included:

- Evaluating all consecutive stroke patients for characteristic dissection-like symptoms such as uncommon unilateral neck or occipital pain, Horner's syndrome, and transient ischemic or amaurosis fugax attacks during the last week before admission. The patients were asked about traumatic head and neck events, recent infection, and chiropractic manipulation of the cervical spine. If the history provided evidence of CAD, further investigation was initiated (see below) to prove the diagnosis.
- In the absence of the above mentioned history, coincidental dissection findings in routine stroke diagnostics

(for example Doppler, MRI) which proved the diagnosis of CAD.

- Coincidental dissection findings in digital subtraction angiography for arterial thrombolysis in acute stroke which proved the diagnosis of CAD.

The criterion for patient inclusion was a diagnosis "cervical arterial dissection" proven by at least one of the following procedures: digital subtraction angiography (DSA), MR or CT angiography (string sign, flamelike stenosis; fig 1) or occlusion, axial MRI of the neck (intramural haematoma, characteristic diameter changes), or Doppler ultrasound techniques (intraluminal flap, dissection membrane, intramural haematoma, total recanalisation of former occlusion).

In addition, the records of all stroke patients that had been treated in our department from January 1995 to December 1998 were analysed retrospectively for a diagnosis of CAD. The data of all CAD patients were compared with those of ischemic stroke patients without dissection who had been cared for during the same time period.

In the CAD group the following common vascular risk factors were assessed: hypertension, diabetes mellitus, hypercholesterolemia, and smoking. There was no specified investigation for diagnosing connective tissue disease (CTD). Both CAD and stroke patients were grouped into a "warm season" (the months April to September) and a "cold season" (the months October to March) group depending on the date of incidence.

Statistics include description of frequency for certain events and ANOVA to test for age dependent group differences. Seasonal differences were calculated by a one-sided Fisher's exact test. A p value <0.05 was considered statistically significant.

RESULTS

A diagnosis of CAD was made in 30 out of 1263 patients (2.4%) with acute or subacute cerebral circulatory disturbances. Additionally CAD was diagnosed in four patients after presentation with severe unilateral neck pain without any neurologic signs. We found 29 internal carotid artery and five vertebral artery dissections. The mean age of all stroke patients was 63.1 years (standard deviation (SD) 14.2 years; median 64 years). The mean (SD) age of patients with CAD was 50.3 (14.6) years; median 48 years) with no gender difference: 50.5 (14.7) years for women ($n=10$) and 49.9 (14.7) years for men. Nearly one third (32.4%) of the CAD patients were older than 60 years of age. The complete age related percentage distribution of both CAD and stroke patients is shown in table 1.

One CAD patient had a recent history of a traumatic event. In none was there any anamnestic, clinical, or radiological evidence of connective tissue disease. In two patients

Abbreviations: CTD, connective tissue disease; DSA, digital subtraction angiography; ICA, internal carotid artery; SD, standard deviation



Figure 1 Digital subtraction angiogram (DSA) of a 65 year old patient showing spontaneous dissection of the right internal carotid artery (ICA). Close to bulb the stenosis is tapered (1) with a filiform remaining lumen (flamelike or tapered sign) (2). Between the beginning of the stenosis and the carotid bulb a gap remains without any dye; this is as a pseudo-occlusion (3) due to atherosclerotic changes of the artery (the term “atherosclerotic dissection” should be used because the (image) morphology combines both aspects). CCA, common carotid artery.

dissection was diagnosed shortly after a chiropractic manoeuvre of the cervical spine. It was unclear, however, if the dissections had been caused by the chiropractics since in both cases neck pain was the reason for the patient to undergo the procedure.

In 23 cases CAD occurred during the colder months (October–Mar) compared to 11 in the warmer season. Considering the entire stroke group, ischemic events were equally distributed over the year ($n = 644$ from October to March compared to $n = 619$ from April to September). This greater incidence of CAD during the colder months was significant ($p = 0.035$).

The characteristic pain history (occurrence in 61.8% of the CAD patients), occurrence of Horner’s syndrome (found in 14.7%), and transient hemispheric ischemic events or amaurosis fugax (20.6%) were not statistically related to age. History or the presence of at least two or more conventional vascular risk factors was found in 41.9% of the CAD patients and was more likely in the CAD patients older than 60 years ($p < 0.001$). Stroke occurrence and pattern

Table 1 Age related ischemic events and CAD

Age (years)	Ischemic events (total = 1263)		CAD (total = 34)		Ischemic events due to CAD (30*/1263)	
	n	%	n	%	n	%
<40	90	7.1	10	29.4	9/90	10.0
40–60	395	31.3	13	38.2	12/395	3.0
>60	778	61.6	11	32.4	9/778	1.2

*In four patients CAD was diagnosed after presentation with severe unilateral neck pain without any cerebral ischemic signs.

as well as recanalisation rate (50% within inpatient course) were not related to age.

DISCUSSION

CAD is considered to be a major cause of cerebral ischemic events in young and middle aged adults, but a rare possible cause of stroke in the elderly. Most published studies concerning CAD do not mention the frequency or age distribution of patients. A comprehensive analysis is given by Schievink *et al*⁶ who described 200 cases. In this study 29% ($n = 58$) of patients were older than 50 years and only 8% ($n = 16$) older than 60 years. However, the selection criteria may have caused bias because the authors identified the CAD patients retrospectively by using a computer-based indexing system. Nevertheless, in our study we found no significant difference in the mean (SD) age of the prospectively ($n = 15$; 49.5 (16.6) years) and the retrospectively studied patient groups ($n = 19$; 50.9 (13.3) years).

The percentage distribution in our study suggests that the occurrence of CAD is not related to a specific period in life (table 1). In the past, most cervical artery dissections were diagnosed in young or middle aged patients, perhaps because younger patients with ischemic stroke are more often suspected of suffering from CAD than middle aged or elderly patients.⁷ As we also show in table 1, the likelihood of stroke due to dissection in the older group is much less compared to the younger group. However, from the viewpoint of a single patient, the risk of experiencing a dissection appears to be the same throughout life. From the viewpoint of a neurologist, the probability of discovering a dissection as the main cause of stroke is higher in the younger patient as these patients normally do not suffer from other vascular diseases, unlike older stroke patients. The presence of cerebro- or cardiovascular risk factors, however, is not a counter-argument against a diagnosis of CAD.

In practice differentiation between artery dissection and rupture of an atheroma may be difficult. MRA, axial fat suppressed T₁-weighted MRI of the neck, and Duplex findings are almost similar in both diagnoses.⁸ This specific diagnostic problem is illustrated in fig 1. The angiogram could be interpreted as a tapered occlusion due to spontaneous artery dissection or chronic atherosclerotic disease. In fact we favour use of the term “atherosclerotic dissection” because the (image) morphology combines both aspects.

The pre-hospital and clinical course of CAD patients does not depend on age; the typical history of neck and occipital head pain or the observation of Horner’s syndrome is equally frequent in young and elderly patients. The presentation of transitory ischemic symptoms or the occurrence of a manifest stroke is also not associated with age. We were able to confirm the recent observation that dissections occur significantly more often during the colder months.^{9, 10} This holds true for all age groups, and might be an indirect confirmation of the hypothesis that apparent infections of the gut or the respiratory tract might be a risk factor for the occurrence of cervical artery dissections.¹⁰

In summary, the results of the present study indicate (a) that the frequency of CAD in the elderly is low compared to the incidence of stroke and (b) that the probability a dissection being the main cause of cerebral ischemia in this patient group is much less than in the younger age group. But, as we also show, a significant number of CAD can occur in the older age group and this must be considered in the differential diagnosis. As regards common therapeutic consequences, the clinical relevance of the correct diagnosis should not be underestimated. Following the hypothesis that underlying arteriopathy is associated with dissection of arteries supplying the brain, the rate of incidence must be equal throughout life.

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