Seasonal pattern of spontaneous cervical artery dissection

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Object. The etiology of spontaneous cervical artery dissection is poorly understood; however, it may involve genetic and environmental factors. The purpose of this study was to determine whether seasonality of spontaneous cervical artery dissection exists.

Methods. The seasonal pattern of spontaneous cervical artery dissection was analyzed in a group of 200 consecutive patients (104 females and 96 males with a mean age of 44.9 years) who were evaluated using the Rayleigh test during the period from 1970 to 1990. The majority of patients resided in the midwestern section of the United States, where large seasonal fluctuations in climate occur. A circannual periodicity was found in the frequency of spontaneous cervical artery dissections with a peak occurring in October \( p < 0.02 \). The seasonal variation was substantial, with approximately 58% more patients suffering a cervical artery dissection during autumn than during other seasons.

Conclusions. A seasonal pattern of spontaneous cervical artery dissection exists with a peak occurring in October. The cause of the seasonality remains to be explained; however, weather- or infectious disease–related factors may provide etiological leads.

Key Words • dissecting aneurysm • carotid artery • cerebrovascular disease • dissection • season • vertebral artery

Spontaneous cervical artery dissections are recognized as being an important cause of ischemic stroke, particularly in young and middle-aged adults.\(^{12,16}\) They may also cause isolated head or neck pain, Horner’s syndrome, pulsatile tinnitus, and cranial nerve palsies.\(^{4,12,16}\) In spite of the increased recognition of spontaneous cervical artery dissections over the last decade, their cause and pathogenesis remain largely unknown. An underlying arteriopathy clearly plays a role in a significant proportion of patients,\(^{21–23,25}\) whereas the common occurrence of a more or less trivial precipitating traumatic event indicates that external factors also play a role.\(^{12,16,28}\)

Numerous investigations into the specific nature of the underlying arteriopathy have been performed, but results have been unrevealing so far.\(^{6,14,15,17,27}\) Investigations into environmental or other external factors in the origin of spontaneous cervical artery dissections have been sparse. The purpose of this study was to determine whether a seasonal pattern exists in the frequency of spontaneous cervical artery dissections.

Clinical Material and Methods

The study population consisted of 200 consecutive patients with angiographically documented spontaneous cervical artery dissections who were evaluated at the Mayo Clinic between 1970 and 1990. The mean age of these 104 female and 96 male patients was 44.9 years (range 16–76 years). The characteristics of this cohort of patients have been described in detail previously.\(^{24}\) A dissection was considered spontaneous when no penetrating or major blunt trauma to the neck preceded the onset of symptoms. An analysis of the patients’ residential zip codes was used to identify a subgroup of patients living within 500 km of our community; this was done to ensure relative comparability of seasons.

The seasonal pattern of cervical artery dissections was analyzed using the date of onset of symptoms, which was available for all patients. The chronobiological analysis was performed using the Rayleigh test,\(^{7}\) an appropriate test for detecting a cyclic trend. The Rayleigh test is a circular one-sample test for randomness, in which data are presented in the form of the rim of a circle divided into equal sectors, corresponding to time intervals, and a number in each rim sector specifies the number of events observed. We divided the rim into 12 roughly equal time sectors of 1 month each. January was located at 0°, July at 180°, and December at 330°. The null hypothesis assumes events are distributed uniformly throughout the year. The \( \alpha \) level of significance was set at 0.05.

Results

A statistically significant circannual periodicity was found in the frequency of spontaneous cervical artery dissections with a peak observed in October \( (Z = 4.49; p < \)
0.02) (Fig. 1 upper). The seasonal variation was of a substantial magnitude, with approximately 58% more patients suffering a cervical artery dissection during autumn than during spring, summer, or winter (Fig. 1 lower). When the year was divided into 365 days instead of 12 months, the results remained significant and a peak during autumn persisted when the years were grouped into four quartiles (1970–1981, 1982–1984, 1985–1987, and 1988–1990) based on the distribution of the years (Fig. 2).

Limiting the patient population to 143 patients living within 500 km of our community, the seasonal variation with a peak in October persisted (Z = 3.58; p < 0.05).

**Discussion**

In this study, we observed a seasonal pattern in the frequency of spontaneous cervical artery dissections with a peak appearing during the autumn months. This observation supports the hypothesis that cervical artery dissections may be triggered by environmental events. The common occurrence of multivessel dissections in patients of similar age and the relatively high rate of recurrent dissection within 1 month of the initial dissection had previously suggested that external or transient factors may play a role in the development of spontaneous cervical artery dissections.

The cause of the seasonal pattern in our patients with spontaneous cervical artery dissections is unclear and cannot be determined from the present study. Circannual rhythms have been reported in patients suffering from several acute vascular disorders including subarachnoid hemorrhage, spontaneous cerebral hemorrhage, ischemic stroke, myocardial infarction, and pulmonary embolism, although some of these associations have been refuted.

Numerous theories have been proposed to explain the seasonal variations in these vascular events, including weather-related changes in blood pressure, coagulation parameters, rheological factors, physical activity, diet, and air pollution. The autumn season in our geographic area is characterized by substantial changes in the weather pattern, which occasionally occur over very short periods of time: for example, “Indian summer” and early snow storms. An alternative explanation for the seasonal pattern observed in our study may be that infections that peak during the autumn months act as triggers for cervical artery dissections. It is unclear whether frequent coughing and sneezing due to an upper respiratory infection or a viral-induced arteriopathy can be implicated. Recently, several studies have focused on infections...
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as precipitating factors of ischemic stroke\textsuperscript{11,20} and, specifically, cervical artery dissection.\textsuperscript{10,11} Infectious diseases with outbreaks in the autumn in our geographic area include those caused by paraninfluenza-, rhino-, and enteroviruses.\textsuperscript{31}

The main shortcoming of our study is that it was not community based, but rather focused on a largely referral based population, many of whom resided quite far away. This not only may have introduced a referral bias, but also may have negated the effects of local environmental factors, including those related to weather and infections.\textsuperscript{20,26} Nevertheless, limiting the patient population to those living within 500 km of our community did not change the observed seasonal variability and statistical significance remained.

References


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