Vertebral Artery Dissection: Warning Symptoms, Clinical Features and Prognosis in 26 Patients

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ABSTRACT: Background and objectives: Internal carotid artery dissection has been extensively studied and well-described. Although there has been a recent increase in the number of reported cases of vertebral artery (VA) dissection, the clinical variety of presentation and the early warning symptoms have not been well-described before. Our objectives in this study include: (1) To determine the early symptoms and warning signs which may help the clinician in the early identification and treatment of patients with VA dissection. (2) To explore the variety of clinical presentation of VA dissection and its relation to prognosis. Design and setting: Retrospective analysis of hospital records in a tertiary academic centre for the period 1989-1999. Results: Twenty-six patients were identified (13 men and 13 women). The mean age was 48. Possible precipitating factors were identified in 14 patients (53%). Sporting activity and chiropractic manipulations were the most common (15% and 11% respectively). Headache and/or neck pain was the predominant feature in 88% of patients and was a warning sign in 53%, preceding onset of stroke by up to 14 days. The most common clinical features included vertigo (57%), unilateral facial paresthesia (46%), cerebellar signs (33%), lateral medullary signs (26%) and visual field defects (15%). Bilateral VA dissection was found in eight patients (24%). The most common region of dissection was the C1-C2 level (16 arteries, 51%). Intracranial VA dissection was found in six patients (24%). The most common region of dissection was the C1-C2 level (16 arteries, 51%). Bilateral VA dissection was found in eight patients (24%). The most common region of dissection was the C1-C2 level (16 arteries, 51%). Bilateral VA dissection was found in eight patients (24%). The most common region of dissection was the C1-C2 level (16 arteries, 51%). Bilateral VA dissection was found in eight patients (24%). The most common region of dissection was the C1-C2 level (16 arteries, 51%). Bilateral VA dissection was found in eight patients (24%). The most common region of dissection was the C1-C2 level (16 arteries, 51%). Bilateral VA dissection was found in eight patients (24%). The most common region of dissection was the C1-C2 level (16 arteries, 51%). Bilateral VA dissection was found in eight patients (24%). The most common region of dissection was the C1-C2 level (16 arteries, 51%). Bilateral VA dissection was found in eight patients (24%). The most common region of dissection was the C1-C2 level (16 arteries, 51%). Bilateral VA dissection was found in eight patients (24%). The most common region of dissection was the C1-C2 level (16 arteries, 51%). Bilateral VA dissection was found in eight patients (24%). The most common region of dissection was the C1-C2 level (16 arteries, 51%). Bilateral VA dissection was found in eight patients (24%). The most common region of dissection was the C1-C2 level (16 arteries, 51%). Bilateral VA dissection was found in eight patients (24%). The majority of patients will have excellent prognosis, this was less likely in patients presenting with subarachnoid hemorrhage or bilateral VA dissection. Recurrence rate was low.

Conclusions: Our findings show that VA dissection affects mainly middle age persons and involves both sexes equally. Headache and/or neck pain followed by vertigo or unilateral facial paresthesia is an important warning sign that may precede onset of stroke by several days. Although the majority of patients will have excellent prognosis, this was less likely in patients presenting with subarachnoid hemorrhage or bilateral VA dissection. Recurrence rate was low.

number of reported cases of vertebral artery (VA) dissection, a study of the patients presented in this report show that VA dissection diagnosis is frequently not considered in the younger patient with typical symptoms. In many instances, the diagnosis in patients with multiple suggestive symptoms is missed until after stroke develops. Our objectives of presenting this series include identifying the early symptoms that should raise suspicion of VA dissection, explore the variety of clinical presentation of VA dissection, and to evaluate the prognosis and frequency of recurrence.

SUBJECTS AND METHODS

We reviewed and studied medical records of all patients less than age 60 with stroke and all patients who underwent cerebral angiography between 1989-1999 at the University of Alberta Hospital, Edmonton. We excluded patients with traumatic arterial dissection and patients with only occlusion of a VA on angiograms without angiographic evidence of dissection in the other VA. Twenty-six consecutive patients with VA dissection were identified. We studied their demographic features; presence or absence of warning symptoms; cumulative symptoms and signs; the presence of predisposing factors; the prevalence of diabetes mellitus, hypertension or migraine; neuroimaging and angiographic findings and type of treatment received. All patients, except one, had standard four vessel cerebral angiography within five days of stroke onset. One patient was diagnosed with magnetic resonance angiography. Follow-up was possible in twenty patients. The duration of follow-up ranged from four weeks to five years. For the purpose of classification we used a simple four category outcome scale:

Table 1: Cumulative symptoms*

<table>
<thead>
<tr>
<th>Symptom</th>
<th>No. of Patients</th>
<th>Approx. Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>22</td>
<td>88%</td>
</tr>
<tr>
<td>Only neck pain</td>
<td>4</td>
<td>15%</td>
</tr>
<tr>
<td>Only headache</td>
<td>13</td>
<td>50%</td>
</tr>
<tr>
<td>Both</td>
<td>5</td>
<td>19%</td>
</tr>
<tr>
<td>Headache by location:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occipital</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Maxillary</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Temporal</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Dizziness/vertigo</td>
<td>15</td>
<td>57%</td>
</tr>
<tr>
<td>Nausea/vomiting</td>
<td>14</td>
<td>53%</td>
</tr>
<tr>
<td>Unilateral facial numbness</td>
<td>12</td>
<td>46%</td>
</tr>
<tr>
<td>Unsteadiness</td>
<td>11</td>
<td>42%</td>
</tr>
<tr>
<td>Diplopia</td>
<td>6</td>
<td>23%</td>
</tr>
<tr>
<td>Dysarthria</td>
<td>4</td>
<td>15%</td>
</tr>
<tr>
<td>Dysphagia</td>
<td>3</td>
<td>11%</td>
</tr>
<tr>
<td>Limbs numbness</td>
<td>3</td>
<td>11%</td>
</tr>
<tr>
<td>Limb weakness</td>
<td>3</td>
<td>11%</td>
</tr>
</tbody>
</table>

*combination possible

(1) Patients without neurological deficit;
(2) Patients with mild deficits, which did not prevent the patient from performing work and/or major daily activities; for example, slight unsteadiness;
(3) Patients with significant neurological deficit preventing from the performance of work and/or other major activities;
(4) Death.

RESULTS

Age and Sex

Of the 26 patients identified, there were 13 men and 13 women. Age ranged between 29 and 76 (mean age 48).

Symptoms

These were categorized into warning symptoms and cumulative symptoms. Fourteen patients reported having symptoms before onset of stroke. The delay between onset of warning symptoms and stroke onset ranged between 1 to 14 days. The most common warning symptom was headache and neck pain. This was usually of sudden onset, severe and, though not accompanied by other symptoms or signs, persistent until the onset of stroke. With respect to cumulative symptoms assessed in each patient, pain was again the most frequent symptom (22 patients, 84%). Thirteen patients presented with headache only, four patients with neck pain only and five patients presented with both symptoms. Table 1 summarizes the location of headaches in those patients.
Dissection risk factors

The history revealed a possible link between the onset of dissection and specific predisposing factor in 14 of the patients in this series. This was related to sports activities (four patients), chiropractic maneuvers (three patients) and possible neck injuries in seven patients. The details of the precipitating factors are summarized in Table 2.

Clinical signs on presentation

Cerebellar signs were the most common objective finding on neurological examination (nine patients). This was unilateral in five patients. Gait ataxia was evident in the remaining four patients. Lateral medullary syndrome signs were present in seven patients, these were partial in five of them. Four patients had visual field abnormalities (two had homonymous hemianopia and two had homonymous quadranopia). Three patients presented with basilar artery syndromes, all had decreased level of consciousness, one of them had Parinaud syndrome and one presented with quadripariesis. There were no clinical findings in three patients – all of them came to medical attention because of vertigo or headache.

Neuroimaging

In nine patients neuroimaging was normal. Infarction was noted in 17 patients. The most common radiological finding in these patients was cerebellar infarction which was evident in ten patients. The second most common site of involvement was the occipital lobe, which was involved in four patients. Subarachnoid hemorrhage (SAH) was noted in three patients. The dissection was found to be intracranial in all three patients with SAH. Cerebral angiography findings are summarized in Table 3. Two representative images are shown in Figure 1 and 2.

Treatment

Different treatment modalities were used in our patients according to clinical situation and physician judgment. All three patients who presented with intracranial VA dissection associated with SAH were treated with endovascular occlusion. This was
followed by surgical clipping of the pseudo-aneurysm in one patient. Two patients (7%) were treated with intra-arterial thrombolysis. One of these patients presented with signs of basilar artery thrombosis. Cerebral angiography revealed extracranial VA dissection with thrombosis extending to basilar artery. She was treated with intra-arterial t-PA and made an excellent recovery. The other patient had dissection with occlusion of one extracranial VA and hypoplasia of the other artery and developed subacute progressive brain stem signs. She was unsuccessfully treated with intra-arterial Urokinase. Eight patients (30%) received antiplatelet agents as the only treatment and 13 patients (50%) received anticoagulation treatment. The duration of anticoagulation was very variable. This was for less than a week in four patients, for two months in two patients and for six months in another three patients. The duration of anticoagulation could not be identified in four patients.

Prognosis

Of the 20 patients who were available for follow-up, eight (40%) had no residual neurological deficit. Eight patients (40%) had mild residual symptoms. These consisted of mild imbalance and dizziness in six patients, partial visual field defects in two and difficulty with fine motor movements in one patient. Two patients (10%) were left with disabling deficits. Two other patients in our series died in the acute stage. Only two patients (10%) have had recurrent neurological symptoms that were transient in both cases.

DISCUSSION

VA dissection is an important cause of stroke in young patients. The incidence of VA dissection is not known precisely. Once thought to be relatively uncommon, it is now being recognized more frequently. In our series, more than 60% of the cases studied were diagnosed in the last two years compared to only one patient diagnosed before 1995. During 1998, ten patients with VA dissection were identified in our institute. Although some earlier reports suggested a predominance of VA dissection in females, our data did not show any significant difference in incidence between women and men. With a mean age of 48, the present study also confirmed that VA dissection mainly affects middle-aged adults.

We found a precipitant factor in 53% of our patients. Sports activity and chiropractic manipulation were again prominent precipitating factors. After reviewing 90 reported cases of VA dissections in the literature, we found that a similar percentage (49%) was associated with minor trauma or neck manipulation. It is important to inquire in detail about recent physical activities if arterial dissection is suspected as the etiology of a stroke.

The role of trivial, unnoticed trauma producing dissection is not clear. It has been suggested that patients with “spontaneous” VA dissection may have had unrecognized trauma or sudden neck motion that was forgotten or considered insignificant by the patient and thus not reported to the physician.

Pain in our series was a crucial symptom seen in the majority of patients (88%). This was mainly headache with or without neck pain. Typically, the headache was occipital and severe in nature. Our data are consistent with previously reported cases of reported neck pain or headache in 76-100% of VA dissection patients.

Headache and neck pain were also an important warning sign before the onset of stroke. This was reported by 53% of the patients, one day to two weeks before the onset of their stroke. Some of the patients had sought medical advice for these early signs. One patient, who presented initially with acute neck pain and vertigo, underwent lumbar puncture to rule out SAH and then was discharged from hospital, presented later with brain stem infarction.

The extracranial cerebral arteries are known to be pain sensitive and the pain may be a signal of mural hemorrhage. According to Sturzenegger, who studied warning symptoms in 44 patients with internal carotid artery dissection, this pain seems to be a key symptom with regard to starting anticoagulation before cerebral infarction has occurred. This may be of similar importance in VA dissection, especially with the observation in our study that 12% of patients had no abnormal signs on presentation and many presented with minimal signs. Some patients repeatedly presented to the emergency room before developing brainstem or cerebellar strokes. Four other important symptoms reported by about half of our patients were: (1) vertigo; (2) nausea or vomiting; (3) unilateral facial numbness (this symptom was subjective and no abnormality was found by sensory testing); (4) unsteadiness.

Three of our patients presented with SAH due to intracranial segment VA dissection. Their age was relatively older than the other patients (54, 55 and 76-years-old). Two were diabetic and one was hypertensive. Two patients had a favorable outcome with no significant deficit. However, one patient died due to hydrocephalus and other complications. SAH as a complication of intracranial VA dissection has been reported before in the literature. The proposed mechanism is a dissecting
hematoma that originates between the media and adventitia. This is more likely to happen in intracranial arteries which lack a well-developed external elastic membrane and have muscularis and adventitial layers that are only about two-thirds as thick as extracranial arteries.\textsuperscript{17-19}

Bilateral VA dissection was found in six patients (23\%). This was also found in previous reports in a range between 15\%-61\%.\textsuperscript{6,8,10,11} Compared to patients with unilateral VA dissection, patients with bilateral VA dissections tended to have a more severe presentation. Two such patients developed bilateral pontine infarction signs, while another two had cerebellar infarction. One had lateral medullary syndrome and one patient had posterior cerebral artery territory infarction. Multi-vessel involvement in the absence of a history of trauma raises the possibility that an underlying arteriopathy may predispose the vessels to dissection. Only two patients had angiographic evidence of fibromuscular dysplasia. No other vascular abnormalities could be identified. The possibility of an as yet unknown arteriopathy in some of the cases cannot be entirely excluded.\textsuperscript{6}

Cerebral angiography was not used as a diagnostic modality in one of our patients. This patient was diagnosed on the basis of his typical clinical presentation, as well as evidence of dissection on MR angiography (Figure 3). Some recent reports suggested that new noninvasive methods, like vertebral Doppler, magnetic resonance imaging and angiography, are useful in detection and monitoring of VA dissection.\textsuperscript{9,20,21}

The overall prognosis was good on clinical follow-up in the majority of patients. Almost 80\% made complete or near complete recovery. The most important factors associated with unfavorable prognosis (disabling outcome or death) were (1) bilateral dissection; (2) dissection associated with subarachnoid hemorrhage.

The recurrence rate of strokes or transient ischemic attacks was very low, occurring in two patients during the available follow-up period.

In conclusion, VA dissection is increasingly being diagnosed. It mainly affects middle-aged persons and both sexes are equally affected. Headache and/or neck pain are prominent features that may precede onset of stroke by several days. Although the majority of patients will have excellent prognosis, this was less likely in patients presenting with SAH or bilateral VA dissection. Recurrence rate was low.

Acknowledgement

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REFERENCES