PAPER

Pain as the only symptom of cervical artery dissection

M Arnold, R Cumurciuc, C Stapf, P Favrole, K Berthet, M-G Bousser

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See end of article for authors' affiliations

Correspondence to: M Arnold, Department of Neurology, University Hospital of Berne, Inselspital, Freiburgstrasse 18, 3010 Bern, Switzerland; marcel.arnold@insel.ch

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Background: Headache or neck pain is a frequent symptom of spontaneous cervical artery dissection (sCAD).
Patients and methods: Patients were drawn from an ongoing hospital-based registry of consecutive cases diagnosed with sCAD. Only patients with isolated pain were included in this series. Pain topography, dynamics, severity and quality, imaging findings and outcome were analysed.
Results: 20 of 245 (8%) patients with sCAD presented with pain as the only symptom (mean (SD) age 39 (8) years; 14 (70%) women). Of them, 12 had vertebral artery dissection, 3 had internal carotid dissection and 5 had multiple dissections. The median delay from symptom onset to diagnosis was 7 days (range 4 h to 29 days). 6 patients presented with headache, 2 with neck pain and 12 with both. Onset of headache was progressive in 6, acute in 8 and thunderclap-type in 4 patients; neck pain was progressive in 7 and acute in 7. Headache was throbbing in 13 and constrictive in 5 patients; neck pain was throbbing in 4 and constrictive in 10. Pain was unilateral in 11 and bilateral in 9. Pain was different from earlier episodes in all but one case. All patients were pain free at 3 months.
Conclusion: Pain may be the only symptom in sCAD, even when multiple arteries are dissected. Pain topography, dynamics, quality and intensity were heterogeneous. Data from this study lend support to recommendations favouring imaging studies of the cervical arteries in patients with new-onset unexplained headache or neck pain.

Spontaneous cervical artery dissection (sCAD) is a well-recognised cause of stroke, particularly in the young, with a wide spectrum of clinical presentations.[1 2] Patients may present with local manifestations, ischaemic signs or both. The typical clinical manifestations of spontaneous vertebral artery dissections (sVADs) are thought to be occipital headache, posterior neck pain or both, as well as posterior circulation ischaemia or subarachnoid haemorrhage (SAH).[3–5] Patients with spontaneous internal carotid artery dissection (sICAD) mainly present with ipsilateral anterior headache or neck pain, Horner's syndrome, cranial nerve palsies and retinal or cerebral ischaemia.[2 6]

Pain is the most frequent local symptom and often the initial manifestation of sCAD. However, it has rarely been reported as the only symptom of sCAD.[7–12] Therefore, to determine patterns of pain that could raise suspicion about sCAD, we analysed patients with sCAD, who presented with only headache or neck pain.

METHODS

From a prospective series of 247 consecutive patients with sCAD presenting at the University Hospital Lariboisière, Paris, France, from January 1997 to October 2005, only those with pain as the only symptom were included in this study. Risk factors for ischaemic stroke and cervical artery dissection were assessed as reported before.[13] Arterial hypertension was defined as a positive history of treated or untreated hypertension. A history of migraine with or without aura was diagnosed by a neurologist on the basis of the International Headache Society's criteria.[14] All patients underwent a neurological examination, a physical examination, routine blood examinations, electrocardiography, magnetic resonance imaging (MRI) of the brain, cervical MRI with T1 fat suppression and magnetic resonance angiography (MRA) or digital subtraction angiography (DSA) of the four neck arteries. Cervical arterial dissection was considered proved if the affected vessel showed a fresh intramural haematoma on axial cervical MRI cuts, or a string sign, intimal flap or pseudoaneurysm on diagnostic angiography.[15–17]

A detailed description of pain characteristics was recorded, including pain distribution (headache or neck pain, unilateral or bilateral), dynamics (mode of onset: thunderclap, acute or progressive), severity and quality. We used a Verbal Analogue Scale (VAS, graded 0–10 in 1-unit increments) to determine maximal pain severity. Severe headache was defined as VAS≥7. Headache dynamics (mode of onset) were defined as follows:

1. Thunderclap, sudden onset of an excruciating pain (VAS>8), reaching maximum intensity in <1 min and lasting >1 h
2. Acute pain, developing in <24 h
3. Progressive pain, developing over >24 h.

Pain quality was categorised into throbbing, constrictive or other. The evolution of the pain syndrome was characterised as continuous or intermittent (with pain-free periods).

Patients with extracranial sCAD were treated with intravenous heparin or low-molecular heparin followed by oral warfarin with a target international normalised ratio of 2.5 (range 2.0–3.0) for 3–6 months. Patients with intracranial extension of sVAD received aspirin 100–300 mg/day for 3–6 months if no SAH was seen on computed tomography or cerebrospinal fluid examination.

Clinical follow-up information 3 months after the index event was obtained through neurological examination.

Abbreviations: DSA, digital subtraction angiography; MRA, magnetic resonance angiography; MRI, magnetic resonance imaging; SAH, subarachnoid haemorrhage; sCAD, spontaneous cervical artery dissection; sICAD, spontaneous internal carotid artery dissection; sVAD, spontaneous vertebral artery dissection; VAS, Verbal Analogue Scale

In this series, we studied demographic data, vascular risk factors, pain characteristics, imaging findings and clinical outcome in all patients presenting with isolated headache or neck pain. Patients with other transient or persisting symptoms or focal abnormalities on neurological examination were excluded from the sample.

RESULTS

Twenty patients presenting with pain as the only symptom of sCAD were identified. Their mean age was 39 (standard deviation (SD) 8; median 41; range 27–53) years, and 14 (70%) were women.

Table 1 summarises potential predisposing and precipitating factors. In all, 8 patients had a history of migraine without aura, 2 had migraine with aura, 12 had hypercholesterolaemia, 1 had a history of hypertension, 4 used oral contraceptives, 2 were past smokers and 1 was a current smoker. One patient reported an infection (fever and angina) 1 week before the dissection. In one patient, VAD was associated with postpartum angiopathy. Three patients reported a minor trauma during the 4 weeks before the dissection.

Twelve patients presented with sVAD, 3 with sICAD and 5 with multiple dissections (3 with bilateral sVAD, 2 with a combination of sICAD and sVAD). The median delay from symptom onset to diagnosis was 7 days (range 4 h to 29 days; mean (SD) 7 (18) days).

Of the 20 patients identified, 6 presented with headache, 2 with neck pain and 12 with both. Tables 2 and 3 show characteristics of headache and neck pain. Onset of headache and neck pain was simultaneous in 6 patients. Headache preceded neck pain in 4 and occurred later in 2 patients. Onset of headache was progressive in 6, acute in 8 and thunderclap in 4 patients. Onset of neck pain was progressive in 7 and acute in 7 patients. Once established, headache was continuous in 15 and intermittent in 3 patients; neck pain was continuous in 12 and intermittent in 2 patients. Headache was throbbing in 13 and constrictive in 5; neck pain was throbbing in 4 and constrictive in 10 patients. Headache was of severe intensity in 13, and neck pain was severe in 8 patients. Pain was unilateral in 11 and bilateral in 9. Neck pain was always on the same side as headache and was also located bilaterally in all patients with bilateral headache. In 10 of 15 patients with unilateral sCADs, pain was located on the side of the dissected artery, and in 5 bilaterally. All 4 patients with bilateral sCAD had bilateral pain and 1 patient with ipsilateral sVAD and sCAD had ipsilateral pain.

Of the 15 patients with unilateral or bilateral sVAD (without associated sICAD), 7 had occipital headache, 2 had hemicrania, 2 had bifrontal pain, 1 had fronto-orbital pain, 1 had diffuse headache and 2 had no headache. Neck pain, if present, was located posteriorly in all patients with VAD.

All three patients with unilateral ICAD had ipsilateral hemicrania, in two of them accompanied by retroauricular pain and in one by laterocervical pain. Associated symptoms included nausea (n = 6), vomiting (n = 1), photophobia (n = 1) and visual aura with fortification spectra and scintillation scotoma in both visual fields preceding headache identical to several previous migraine episodes with aura (n = 1). Pain was different from earlier pain episodes in all except one patient, who described her pain as identical to her usual migraine. The mean duration of headache was 10 days (SD 10; median 7 days; range 3 h to 30 days), and the mean duration of neck pain 11 days (SD 12; median 6 days; range 4 h to 35 days).

Table 1 Baseline characteristics and imaging findings in 20 patients with pain as the only symptom of spontaneous cervical artery dissection

Patient	Sex	Age (years)	Potential predisposing or precipitating factors	Delay to diagnosis (days)	Dissected vessels	Cervical MRI	MRA or DSA findings
1	F	33	HC, Mig	5	VA left, VA right	No mural haematoma Mural haematoma V2	Stenosis V2 Stenosis V2, FMD
2	F	31	HC, OC, MigA	5	VA left	Mural haematoma V3, V4	Stenosis V3, V4
3	F	41	None	3	VA right	Mural haematoma V2	Stenosis V2
4	M	34	None	<1	VA left	Mural haematoma V1	Stenosis V1
5	F	52	Past smoker, Mig	22	VA left, VA right, ICA left	Mural haematoma V2 Mural haematoma V2 Mural haematoma TL	Stenosis V2 Stenosis V2 Stenosis TL
6	F	27	HC, OC, Mig	<1	VA right	Mural haematoma V2	Stenosis V2
7	F	34	Mig	5	VA left	Mural haematoma V2	Stenosis V2
8	F	33	HC, OC, Mig	13	VA left, VA right	Mural haematoma V2 Mural haematoma V1	Stenosis V2 Stenosis V1
9	M	42	Hypertension, HC, minor trauma	2	VA right	Mural haematoma V2	Occlusion V2
10	M	43	HC	29	VA left	Mural haematoma V1	Stenosis V1
11	M	34	Smoking	10	VA right	Mural haematoma V2	Stenosis V2
12	F	38	Past smoking	11	ICA right	Mural haematoma TL	Occlusion TL (flame shaped)
13	F	53	HC	7	VA right ICA right	No mural haematoma Mural haematoma TL	Stenosis V1 Occlusion TL (flame shaped)
14	F	47	HC	10	ICA left	Mural haematoma TL	Stenosis TL
15	F	44	HC	4	VA left, VA right	Mural haematoma V2 Mural haematoma V2	Stenosis V2 Stenosis V2, FMD
16	M	39	HC, Mig, fever, angina, minor trauma	21	ICA right	Mural haematoma TL	Stenosis TL
17	F	27	HC, Mig, postpartum angiopathy	6	VA right	Mural haematoma V2	Stenosis V2, multiple intracranial segmental stenosis
18	F	31	OC, Mig, MigA	8	VA left	Mural haematoma V3	Stenosis V3 Intimal flap
19	F	43	None	12	VA right	Mural haematoma V3	Stenosis V3
20	M	51	HC, minor trauma	<1	VA right	Mural haematoma V2, V3	Stenosis V2–V4

DSA, digital subtraction angiography; F, female; FMD, fibromuscular dysplasia; HC, hypercholesterolaemia; ICA, internal carotid artery; M, male; Mig, migraine without aura; MigA, migraine with aura; MRA, magnetic resonance angiography; MRI, magnetic resonance imaging; OC, oral contraception; TL, typical location 2–3 cm distal to the bifurcation; V1–V4, artery segments; VA, vertebral artery.

Table 2 Characteristics of headache in 20 patients with spontaneous cervical artery dissection

Patient	Onset	Evolution	Quality	VAS	Location	Associated symptoms
1	TCH	Intermittent	Throbbing	9	Bifrontal	Nausea
2	Acute	Continuous	Constrictive	7	Ipsilateral occipital	No
3	Acute	Intermittent (cluster)	Throbbing	10	Ipsilateral fronto-orbital	No
4	No headache	No headache	No headache	No headache	No headache	No
5	Progressive	Intermittent	Constrictive	7	Bioccipital	No
6	Acute	Continuous	Throbbing	7	Ipsilateral hemicranium (usual migraine)	Nausea, photophobia
7	Progressive	Continuous	Throbbing	8	Ipsilateral occipital	Nausea
8	Acute	Continuous	Constrictive	6	Diffuse, posterior predominant	Nausea, vomiting
9	No headache	No headache	No headache	No headache	No headache	No
10	Progressive	Continuous	Constrictive	6	Bioccipital	No
11	Acute	Intermittent	Throbbing	6	Ipsilateral hemicrania	No
12	Progressive	Continuous	Throbbing	6	Ipsilateral hemicrania	Nausea, vomiting
13	Acute	Continuous	Throbbing	5	Bifrontal, bitemporal	No
14	Progressive	Continuous	Throbbing	9	Ipsilateral hemicrania, retroauricular	No
15	Progressive	Continuous	Constrictive	7	Bioccipital	No
16	Acute	Continuous	Throbbing	8	Ipsilateral hemicrania, retroauricular	No
17	TCH	Continuous	Throbbing	10	Bioccipital, biparietal	No
18	Acute	Continuous	Throbbing	9	Ipsilateral occipital, hemicrania	No
19	TCH	Intermittent	Throbbing	10	Diffuse	No
20	TCH	Continuous	Throbbing	9	Bifrontal	Nausea, vomiting, visual aura

TCH, thunderclap headache; VAS, Verbal Analogue Scale.

In 13 patients, sCAD was diagnosed on the basis of cervical MRI and MRA alone, on the basis of DSA in 5, and on the basis of both cervical MRI/MRA and catheter angiography in 2 patients. Overall, cervical MRI showed a mural haematoma in 18 of 20 (90%) patients with sCADs, MRA or DSA showed occlusion in 3 of 25 (12%) dissected arteries, stenosis in 19 (76%), and a pseudoaneurysm with stenosis in 3 (12%).

All sVADs were located extracranially. The proximal beginning of sVAD was located in the V1 segment in 4 patients, in the V2 segment in 14 and in the V3 segment in 3. Two sVADs extended intracranially. In one of them, cerebrospinal fluid examination showed 41 red blood cells and xanthochromia, on the basis of which SAH was diagnosed. In the four patients with sICADs, the site of the dissection started 2–3 cm distal to the bifurcation, and no intracranial extension was seen. MRI of the brain was normal in all patients.

At 3 months follow-up, all patients were free of pain except for their usual pre-existing migraine episodes. No new symptoms occurred during the follow-up period.

DISCUSSION

This is, we believe, the first study analysing clinical and cerebrovascular imaging findings in patients presenting with pain as the only symptom of sCAD. The 20 patients represent 8% of all patients with sCAD seen at the University Hospital Lariboisière, and our findings indicate that pain as the only manifestation of sCAD may be more frequent than expected. Isolated pain was rare in a large US study (4/164 patients) of sCAD, and three of these patients had SAH.[18] In another series of 44 patients with sICADs, only two presented with pain alone.[19] To date, only one patient has been reported with pain as the only symptom of multiple sCAD.[20]

The unusually high frequency of patients presenting with isolated pain in our series may reflect a recruitment bias because our centre has a stroke unit and also an emergency headache centre that recruits nearly 7000 patients with headache every year. Another reason may be the fact that we carry out imaging of the cervical arteries in any patient with recent headache of unknown cause. Finally, earlier

Table 3 Characteristics of neck pain in 20 patients with spontaneous cervical artery dissection

Patient	Onset	Evolution	Quality	VAS	Location	Time course with headache
1	No neck pain	No neck pain	No neck pain	No neck pain	No neck pain	No neck pain
2	Acute	Continuous	Throbbing	7	Ipsilateral posterior	Simultaneous
3	Acute	Continuous	Constrictive	10	Ipsilateral posterior	After headache
4	Acute	Continuous	Constrictive	5	Ipsilateral posterior	No headache
5	Progressive	Intermittent	Constrictive	7	Bilateral posterior	Simultaneous
6	No neck pain	No neck pain	No neck pain	No neck pain	No neck pain	No neck pain
7	Progressive	Continuous	Constrictive	8	Ipsilateral posterior	Simultaneous
8	Acute	Continuous	Constrictive	6	Bilateral posterior	Simultaneous
9	Progressive	Continuous	Constrictive	5	Ipsilateral posterior	After headache
10	Progressive	Continuous	Constrictive	6	Bilateral posterior	No headache
11	Progressive	Intermittent	Throbbing	6	Ipsilateral posterior	Before headache
12	No neck pain	No neck pain	No neck pain	No neck pain	No neck pain	No neck pain
13	No neck pain	No neck pain	No neck pain	No neck pain	No neck pain	No neck pain
14	No neck pain	No neck pain	No neck pain	No neck pain	No neck pain	No neck pain
15	Progressive	Continuous	Constrictive	7	Bilateral posterior	Simultaneous
16	Acute	Continuous	Constrictive	7	Ipsilateral lateral	Simultaneous
17	Progressive	Continuous	Throbbing	8	Ipsilateral posterior	Before headache
18	Acute	Continuous	Throbbing	7	Ipsilateral posterior	After headache
19	Acute	Continuous	Constrictive	6	Ipsilateral posterior	After headache
20	No neck pain	No neck pain	No neck pain	No neck pain	No neck pain	No neck pain

VAS, Verbal Analogue Scale.

presentation of the patients with pain, before the occurrence of ischaemic symptoms, may increase the percentage of patients with isolated pain; however, the median delay from symptom onset to diagnosis was 7 days, with intervals ranging up to 29 days.

The percentage of women in our series of patients with isolated pain was higher (70%) than that in previous studies on patients with sCAD (45–52% women), and patients were younger (mean age 39 years) than those in previous series (44–45 years).[13 21 22] However, our data do not prove that younger and female patients develop ischaemic symptoms less frequently. These demographic differences may be chance observations due to the small sample size. Another explanation may be that younger patients with isolated pain are more likely to be admitted earlier and more often than elderly patients.

The main mechanism of pain in patients with sCAD is thought to be distension of the artery by the mural haematoma with stimulation of pain-sensitive receptors. In this series, there was no uniform pattern of headache or neck pain. The most common characteristics of headache were severe intensity, throbbing quality and continuous course. Neck pain was also continuous in most patients, but more often constrictive and less often of severe intensity. Onset of pain was highly variable, with acute or progressive pain or even thunderclap headache (n = 4), and nine patients had bilateral pain.

As in other series, the occipital area was the most common location of headache in patients with sVAD.[18 23] However, pain was sometimes diffuse or located in the anterior regions of the head in these patients. All three patients with unilateral ICAD had ipsilateral hemicrania, in two of them accompanied by retroauricular pain and in one by lateral neck pain.

All but one patient with migraine considered the pain to be unique and unusual compared with previously experienced headache or neck pain episodes. Nevertheless, pain was often interpreted initially as migraine or musculoskeletal in nature by the patient or the treating doctor. This higher frequency of unusual pain in this study than in other series may indicate that patients with sCAD presenting with isolated pain may have been under-recognised, because those who experience their headache or neck pain as similar to previous episodes are often not admitted for further diagnostic evaluation.[11 18]

Most patients with isolated pain had extracranial sVAD, mainly affecting the V2 segment of the artery, and in only five patients at least one spontaneous internal carotid artery was dissected. sICAD without ischaemia is often associated with Horner's syndrome, cranial nerve palsies or tinnitus.[13] This explains the low number of patients with sICAD presenting with isolated pain. Surprisingly, multiple dissections were observed in five patients with isolated pain, a finding that has been reported in only one patient to date.[20]

In patients with isolated pain, MRA or DSA showed stenosis in most cases (76% of 25 dissected arteries). An aneurysm was found in 3 (12%) and an occlusion in 3 (12%) patients, half the rate observed in our series of patients with cerebral or retinal ischaemia (48/200 dissected arteries). Isolated pain is thus rare in patients with occluded dissected arteries, who mostly present with signs of retinal or cerebral ischaemia.

In conclusion, headache or neck pain may be the only symptom of sCAD seen more frequently than expected. However, on a population-based level, isolated headache due to sCAD still remains a rare event. Patients often present with combined headache and neck pain. The most frequent vessel associated is the extracranial vertebral artery, but patients with sICAD or even with multiple dissections may also present with isolated pain.

We found no uniform pattern of pain, but observed atypical presentations such as thunderclap headache, bilateral pain and intermittent pain in several patients. This emphasises the need to investigate all cervical arteries with MRI or MRA immediately in patients presenting with recent headache or neck pain of unknown cause, to look for dissection and start appropriate treatment to prevent ischaemia.

Authors' affiliations
M Arnold, R Cumurciuc, C Stapf, P Favrole, K Berthet, M-G Bousser, Assistance Publique, Hôpitaux de Paris, Department of Neurology, University Hospital Lariboisière, Paris, France

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