คณะแพทยศาสตร์ศิริราชพยาบาล มหาวิทยาลัยมหิดล

Acute Caudate Vascular Lesions

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Introduction

- Stroke mimics and stroke chameleons
- Vascular and tomographic lesions
- Clinical presentation
- Risk factors and etiology

Introduction

- Stroke should be suspected in any patient with sudden onset neurological symptoms, confusion or falls even if the symptoms initially appear to be unusual for stroke.
- Common stroke mimics include seizure, migraine, sepsis, syncope, and metabolic and functional disorders
- Stroke can present as a chameleon with confusion, reduced conscious level or non-specific symptoms such as vertigo, unsteadiness and reduced conscious level.

Introduction

Stroke mimics admitted to a hyperacute stroke unit

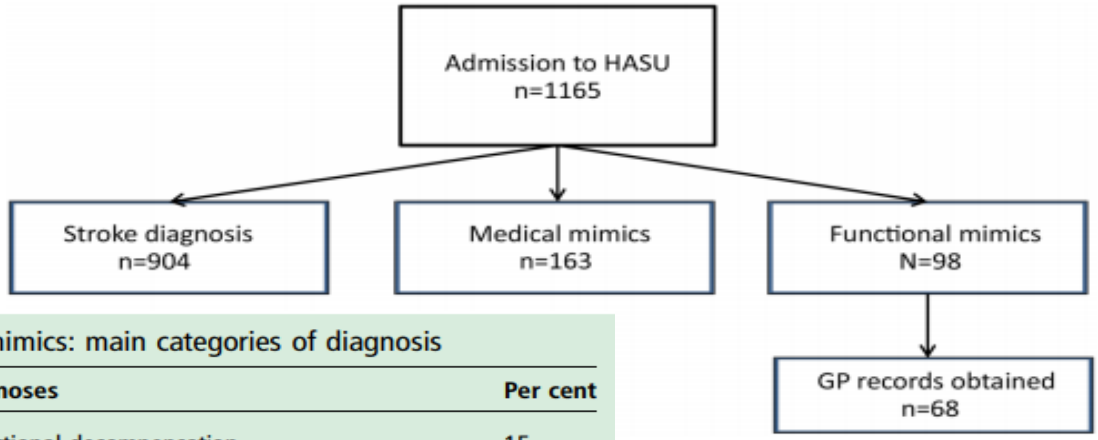


Table 2 Medical mimics: main categories of diagnosis

Medical mimics—diagnoses	Per cent
Previous stroke with functional decompensation	15
Epilepsy	14
Migraine	13
Peripheral vestibular disturbance	9
Cranial neuropathy (including Bell's Palsy)	8
Space occupying lesions (eg, haematoma, tumours)	8
Metabolic or infection	7
Other Neurological (eg, MS)	6
Unclear	4
Cardiac	2
Alcohol related	2
Dementia	2
Ocular pathology	2
Transient amnesia of uncertain cause	2
Syncope	2
Miscellaneous (eg, polycythaemia, giant cell arteritis, drug reaction, antiphospholipid syndrome)	4

Table 4 Follow-up data on functional mimics.

Psychiatric disorder	Percentage (n=32) %*
Depression	(11) 34.4
'Stress-related condition'	(10) 31.25
Anxiety disorder	(5) 15.6
Somatoform pain/somatisation	(2) 6.25
Psychiatric complication of epilepsy/Parkinson's	(2) 6.25
Fatigue	(2) 6.25
Body image disorder	(1) 3.0

*One patient had 2 diagnoses.
Psychiatric diagnosis in GP records.
GP, general practitioner.

Gargalas S, et al. J Neurol Neurosurg Psychiatry 2015;0:1–5.

Introduction

- Missed diagnoses and stroke chameleons
  - The most common conditions for which stroke is mistaken are delirium, syncope, hypertensive emergencies or systemic infection.
    - Acute vertigo
    - Decreased level of consciousness
    - Acute confusional state
    - Severe hypertension
  - The risk of misdiagnosis is higher in younger patients and those with either mild symptoms or coma.
  - 37% of posterior circulation strokes were initially missed compared with 16% of anterior circulation strokes.

Anathhanam S, Hassan A. Mimics and chameleons in stroke. *Clin Med (Lond)*. 2017;17(2):156-160.

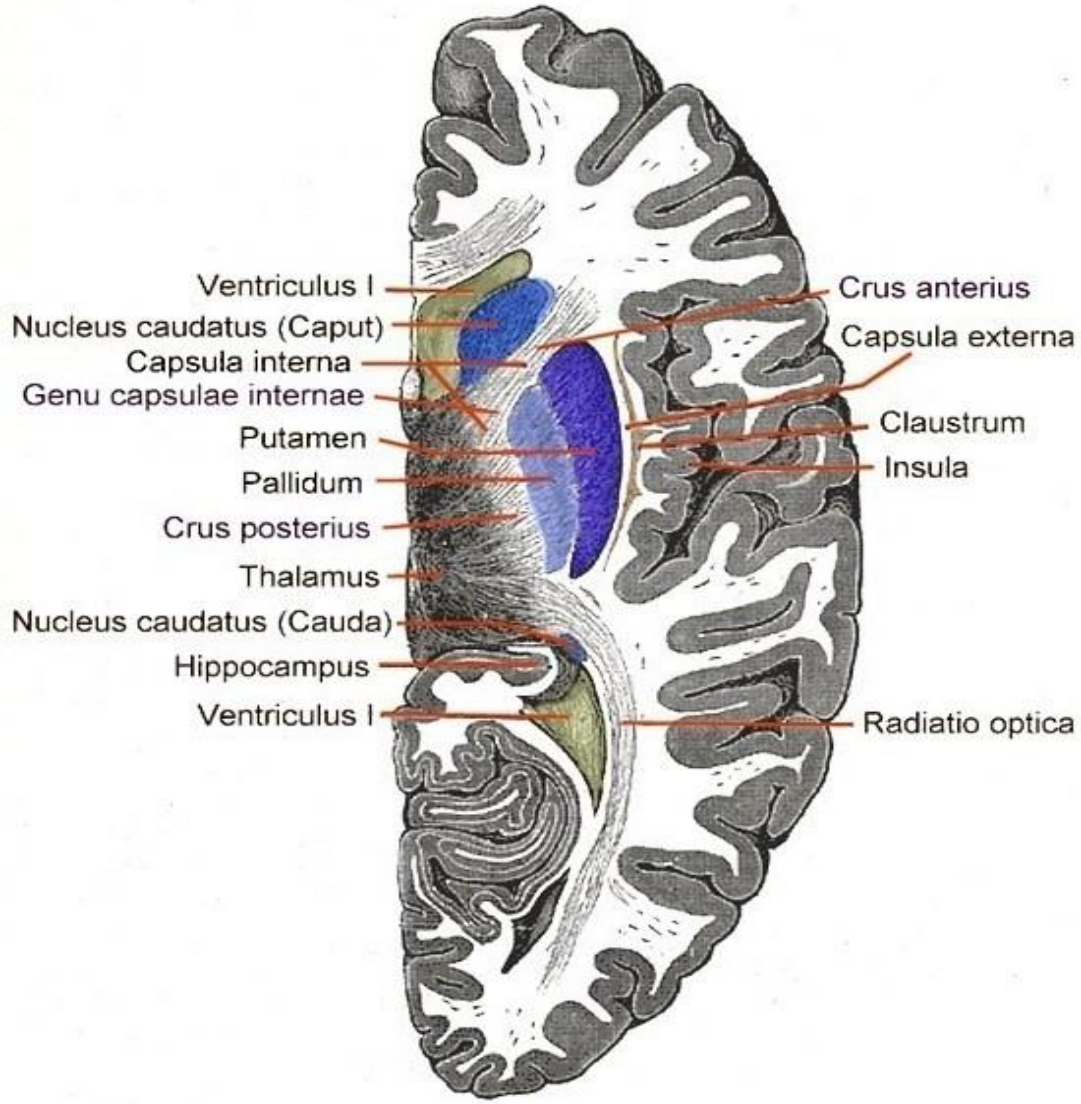
Introduction

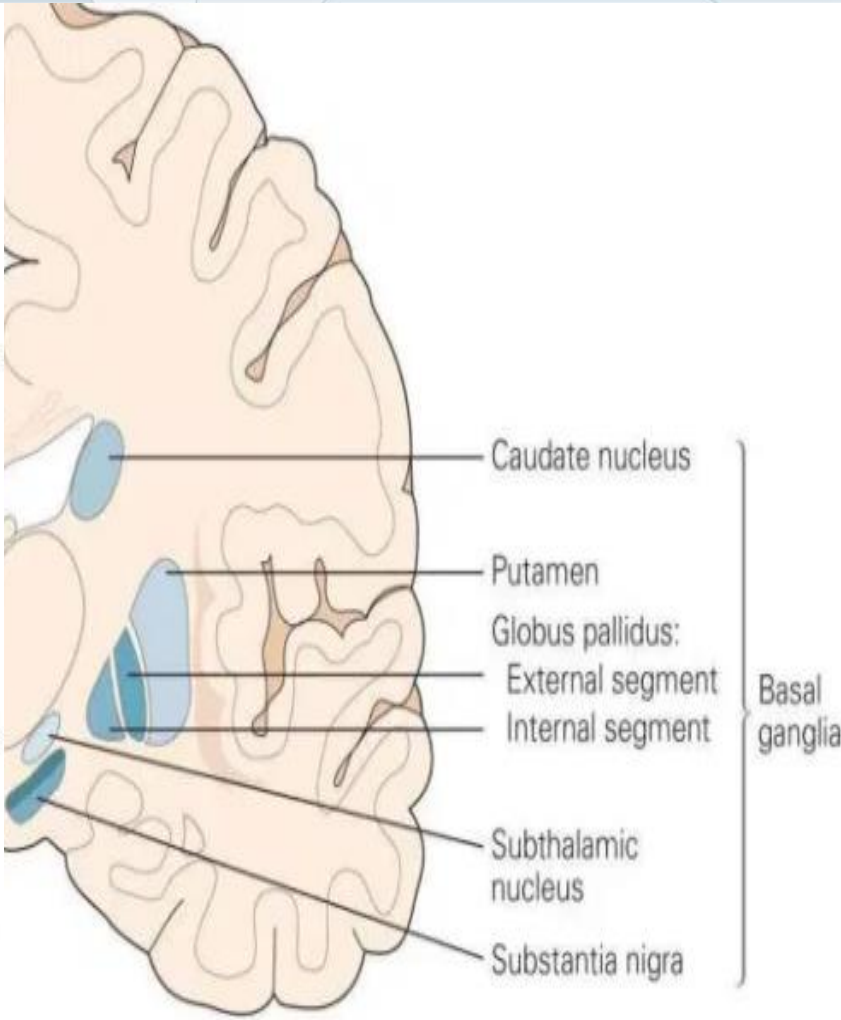
- The role of neuroimaging
  - Negative CT does not exclude stroke
  - MRI can help in cases of diagnostic uncertainty as diffusion restriction is highly sensitive for acute ischemia.

Technique	Uses/benefits	Pitfalls
Non-contrast CT head	Widely available and quick to perform	Low sensitivity (39%) for ischaemia, especially in posterior fossa
	High sensitivity for acute haemorrhage	
	Specificity of 100% if ischaemia detected	
CT angiogram	Non-invasive assessment of intracranial and extracranial circulation	Unreliable in differentiating stroke from mimic (only a minority of strokes will have large artery occlusion)
	Can confirm large vessel occlusion to guide clot retrieval strategies in patients with high NIHSS scores	
Diffusion-weighted magnetic resonance imaging	Abnormalities on diffusion-weighted sequences strongly support diagnosis of stroke	Restricted diffusion can be seen in tumours, cerebral infections and following seizure activity
	Sensitivity for detection of acute stroke up to 99% with specificity of 92%	Patient instability and claustrophobia can limit suitability of scan
		Requires more time for scanning than CT

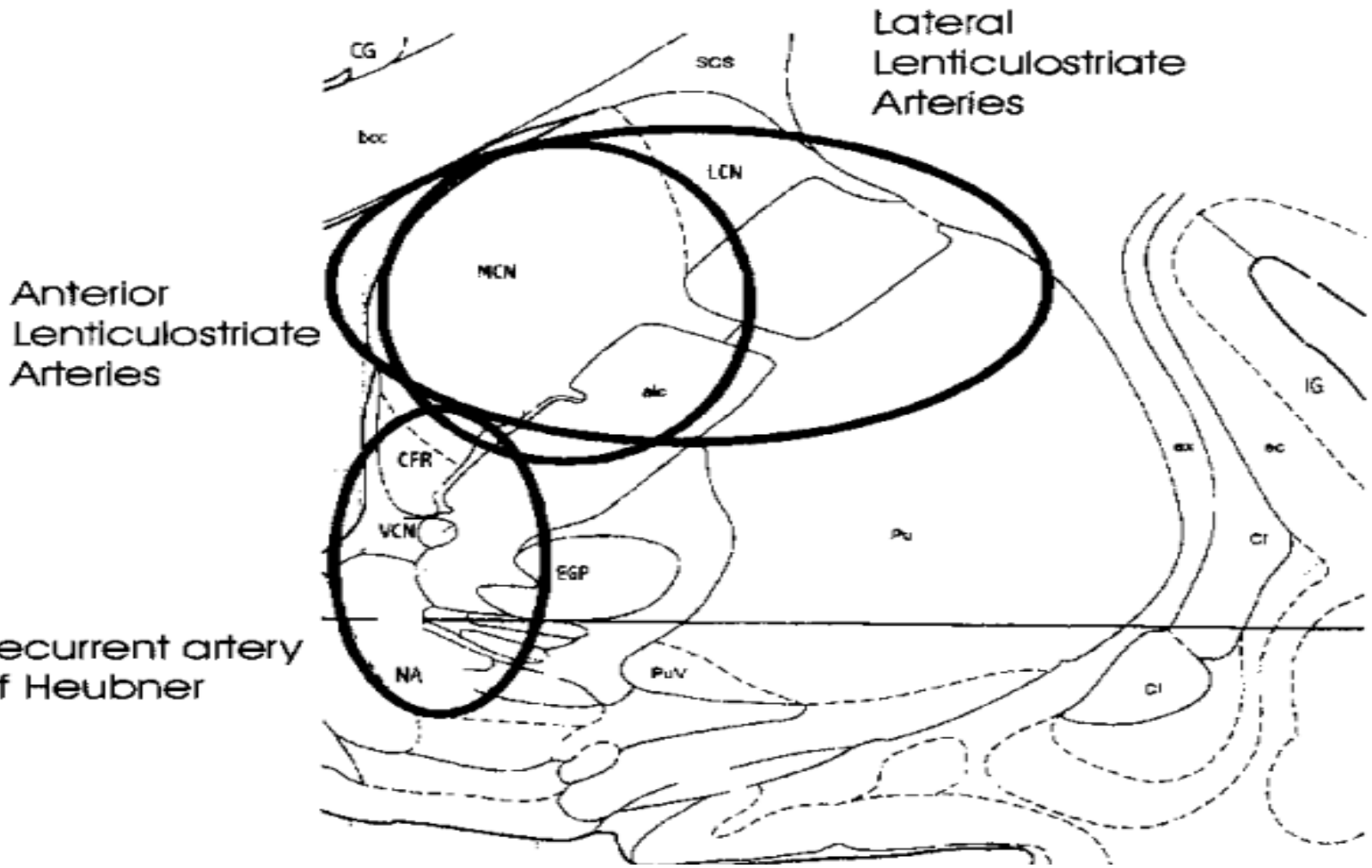
Anathhanam S, Hassan A. Mimics and chameleons in stroke. *Clin Med (Lond)*. 2017;17(2):156-160.

Introduction





Introduction



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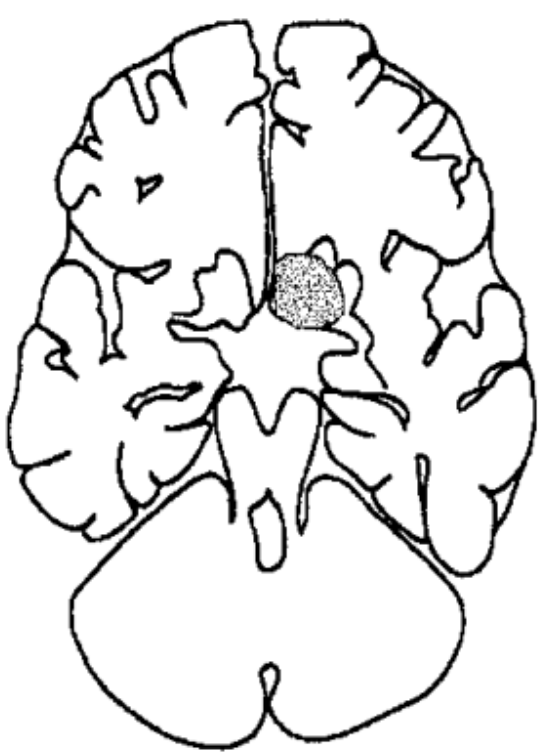
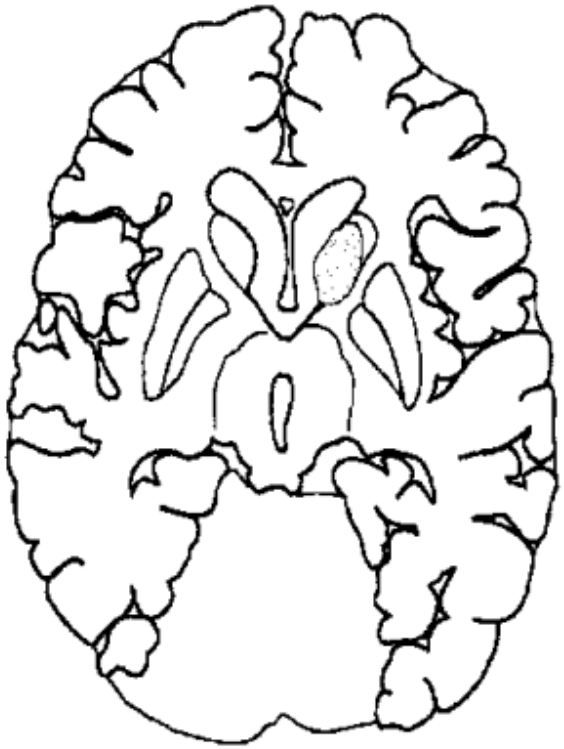
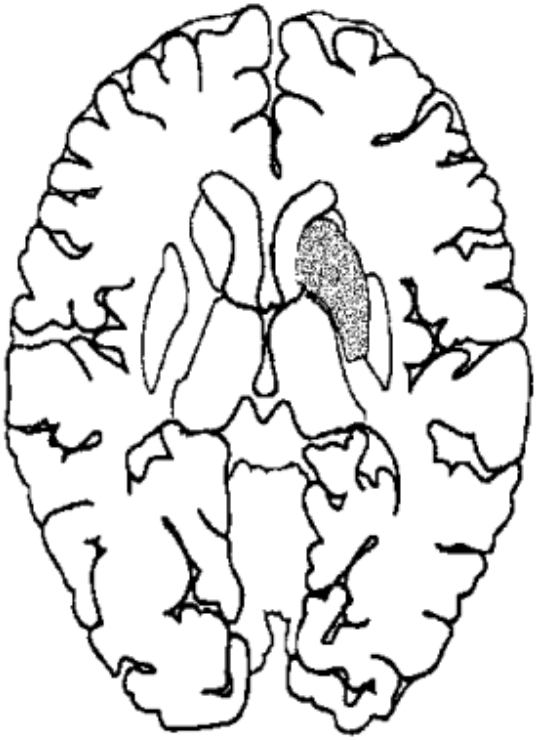
Vascular Lesions



Recurrent artery of Heubner



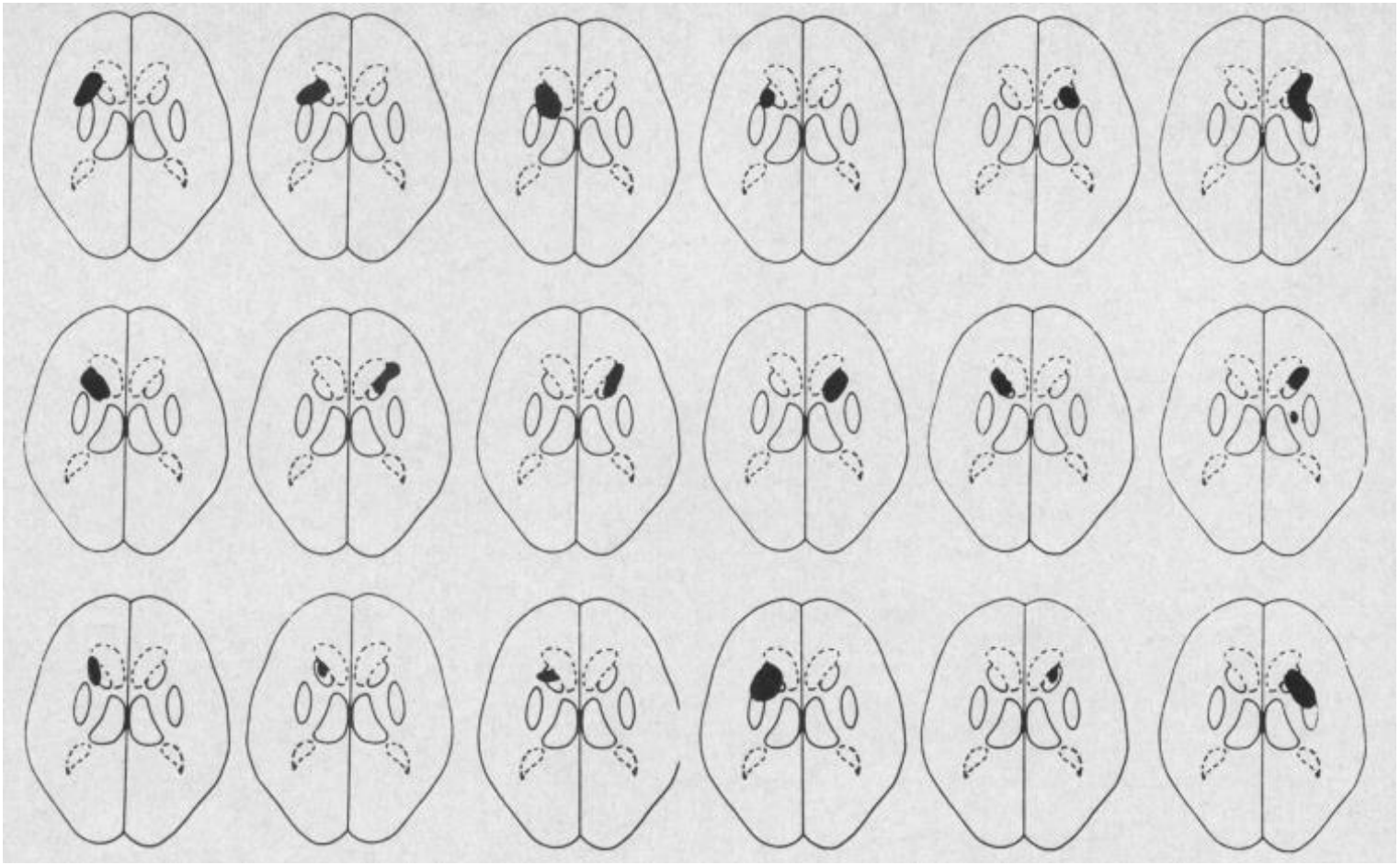
Anterior Lenticulostriate Arteries



Lateral Lenticulostriate Arteries

doi.org/10.1161/01.STR.30.1.100Stroke. 1999;30:100–108

Tomographic lesions



Caplan LR. Caudate infarcts. Arch Neurol. 1990

Topography of Infarcts

- Left caudate infarcts
- Right caudate infarcts
- Bilateral caudate infarcts

Smajlović D. Strokes in young adults: epidemiology and prevention. 2015;11:157-164.

Clinical presentation

- Dysarthria
- Convulsion
- Motor
- Behavioral and cognitive abnormalities

Clinical presentation

TABLE 2. Clinical and Behavioral Findings and Prognosis of Patients With Caudate Infarct

	Unilateral Caudate Infarcts*	Bilateral Caud Infarcts
No.	11/11	3
Dysarthria	5/5	2
Convulsion	2/0	0
Motor		
Face	2/0	0
Face, upper limb	2/3	0
Face, upper limb>lower limb	5/4	2
Chorea	0/1	0

TABLE 2. Clinical and Behavioral Findings and Prognosis of Patients With Caudate Infarct

	Unilateral Caudate Infarcts*	Bilateral Caudate Infarcts
Behavioral findings		
Confusion-disorientation	4/4	3
Abulia	4/5	1
Psychic akinesia	0/1	2
Restlessness	1/2	0
Nonfluent aphasia	3/0	1
Transcortical motor aphasia	1/0	0
Global aphasia	1/0	0
Motor neglect	0/3	1
Visuospatial neglect	0/2	0
Impaired conflictual tasks	3/2	2
Verbal amnesia	3/0	0
Visual amnesia	0/4	0
Visual-verbal amnesia	1/0	2
MMSE ≤28	4/3	2
Depression	2/1	1

doi.org/10.1161/01.STR.30.1.100Stroke. 1999;30:100–108

Dysarthria

- Abnormalities of the articulation of speech were very common, especially in patients with right sided caudate infarcts.

doi.org/10.1161/01.STR.30.1.100Stroke. 1999;30:100–108

Motor

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No.	11/11	3
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Convulsion	2/0	0
Motor		
Face	2/0	0
Face, upper limb	2/3	0
Face, upper limb>lower limb	5/4	2
Chorea	0/1	0

Table 1.—Motor Abnormalities

Weakness		
Severity	**Location**	**No. of Patients**
None		5
Slight		11
	Face, arm, and leg	7
	Face	2
	Mostly hand	1
	Arm and leg	1
Moderate		2
	Face, arm, and leg	2
Total		18

- The characteristics of motor deficits were facial and upper extremity weakness and clumsiness.
- Hemiparesis caused by a caudate nucleus lesion is considered nonpyramidal hemimotor syndrome

Int J Clin Exp Med 2017;10(11):15615-15618

Caplan LR. Caudate infarcts. Arch Neurol. 1990

doi.org/10.1161/01.STR.30.1.100Stroke. 1999;30:100–108

Behavioral and Cognitive Abnormality

- Abulia
  - The most frequent behavioral abnormality was an inactive, slow, apathetic state
- Restlessness and Hyperactivity
  - Confused, restless, or hyperactive at some time during acute stroke

Table 2.—Cognitive and Behavioral Abnormalities

Deficit	No. of Patients	Side of Brain Lesion
None	4	2/10 left; 2/8 right
Abulia	10	6/10 left; 4/8 right
Agitation, hyperactivity	7	3/10 left; 4/8 right
Contralateral neglect	3	3/8 right
Language abnormalities	2	3/10 left

Caplan LR. Caudate infarcts. Arch Neurol. 1990

Behavioral and Cognitive Abnormality

- Contralateral Neglect
- Language Abnormalities
  - Stuttering
- Cognitive abnormalities
  - Poor memory,visualspatial and constructional abnormalities

Table 1. Cognitive and behavioral abnormalities with caudate infarction

Study (No. of patients)	Left lesion		Right lesion	
	Caplan (18)	Kumral (25)*	Caplan (18)	Kumral (25)*
Behavioral findings				
Abulia	6/10	5/11	4/8	6/11
Confusion		7/11		7/11
Psychic akinesia		2/11		3/11
Restlessness		1/11		2/11
Agitation, hyperactivity	3/10		4/8	
Depression		3/11		2/11
Cognition findings				
Memory impairment	2/10		0/8	
Verbal amnesia		3/11		0/11
Visual amnesia		0/11		4/11
Visual-verbal amnesia		3/11		2/11
Contralateral neglect	0/10	1/11	3/8	6/11
Nonfluent aphasia	1/10	4/11	0/8	1/11
Transcortical motor aphasia	1/10	1/11	0/8	0/11
Global aphasia		1/11		1/11

*3 patients had bilateral caudate infarcts in the study of Kumral *et al.*
Caplan (18) (Caplan *et al.* [2]); Kumral (25) (Kumral *et al.* [1]).

doi.org/10.1161/01.STR.30.1.100Stroke. 1999;30:100–108

Behavioral and Cognitive Abnormality

- One-third of patients with a left caudate lesion had verbal amnesia
- Right caudate lesion had visual amnesia
- Procedural and declarative memory may be associated with the left caudate nucleus.
- Visuospatial and motor neglect were present in one fourth of patients with a right caudate vascular lesion.

Table 1. Cognitive and behavioral abnormalities with caudate infarction

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	Caplan (18)	Kumral (25)*	Caplan (18)	Kumral (25)*
Behavioral findings				
Abulia	6/10	5/11	4/8	6/11
Confusion		7/11		7/11
Psychic akinesia		2/11		3/11
Restlessness		1/11		2/11
Agitation, hyperactivity	3/10		4/8	
Depression		3/11		2/11
Cognition findings				
Memory impairment	2/10		0/8	
Verbal amnesia		3/11		0/11
Visual amnesia		0/11		4/11
Visual-verbal amnesia		3/11		2/11
Contralateral neglect	0/10	1/11	3/8	6/11
Nonfluent aphasia	1/10	4/11	0/8	1/11
Transcortical motor aphasia	1/10	1/11	0/8	0/11
Global aphasia		1/11		1/11

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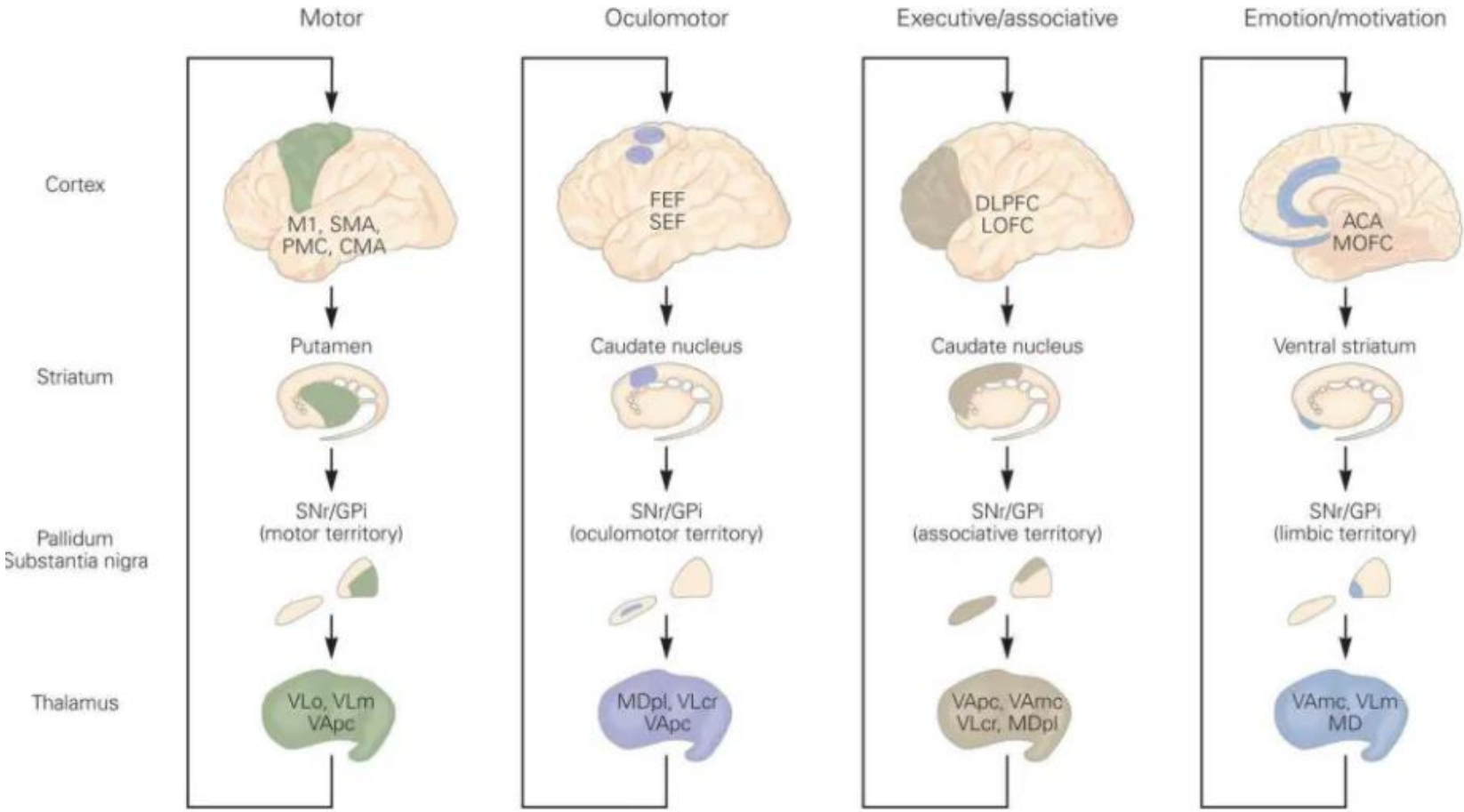
Basal ganglia-thalamocortical circuit



Wichmann and DeLong 2006.

Risk factors

TABLE 1. Demographic Data, Risk Factors, and Cause of Infarct in Patients With Caudate Infarct

	Unilateral Caudate Infarcts*	Bilateral Caudate Infarcts
No.	11/11	3
Age (mean±SD), y	58±9/66±6	59±14
Sex (M/F)	10/1/6/5	3/0
Risk factors		
Hypertension	6/8	2
Diabetes mellitus	5/2	0
Hypercholesterolemia	3/4	1
Smoking	2/1	1
Atrial fibrillation	1/2	0
Myocardial infarct	3/0	2
Familial history of stroke	0/2	0
Transient ischemic attack	7/5	2

- Risk factors for penetrating artery and branch artery disease were prevalent. Fourteen patients (77%) were hypertensive and six patients (33%) had diabetes mellitus.

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Cause of Infarct

TABLE 1. Demographic Data, Risk Factors, and Cause of Infarct in Patients With Caudate Infarct

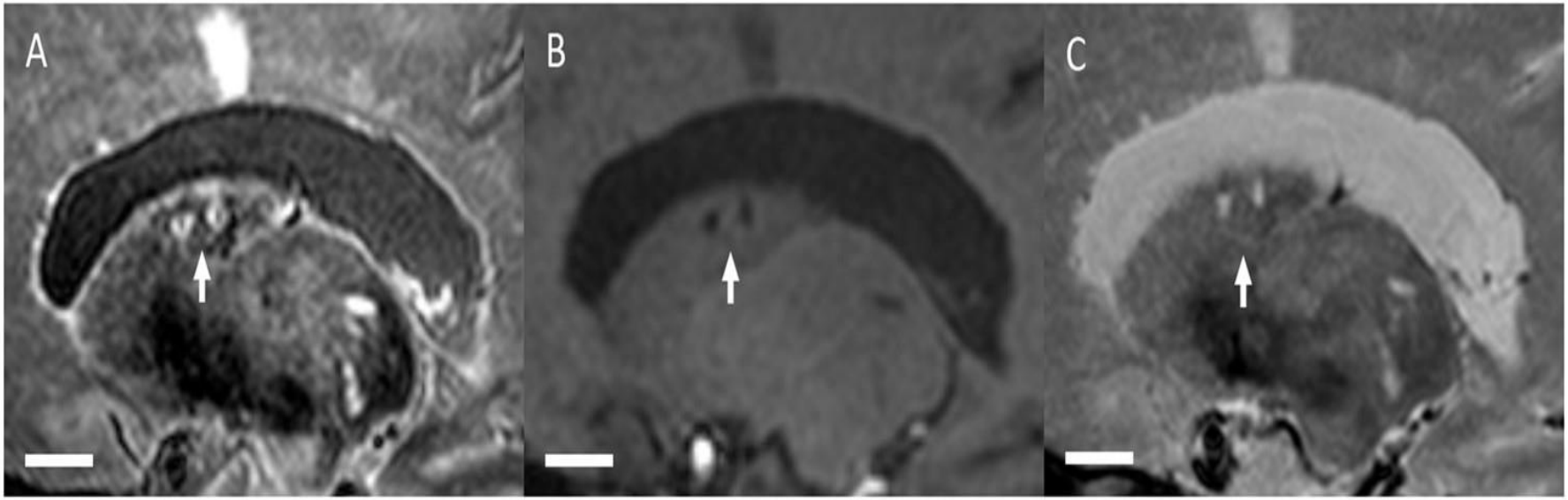
	Unilateral Caudate Infarcts*	Bilateral Caudate Infarcts
Presumed cause		
Large-artery disease	1/1	0
Small-artery disease	6/8	0
Cardioembolism	3/1	1
Mixed†	0/1	1
Syphilis	1/0	0
Unknown	0/0	1

- Small-artery disease
- Cardiac sources of embolism
- Ipsilateral internal carotid artery disease
- Mixed etiology

doi.org/10.1161/01.STR.30.1.100Stroke. 1999;30:100–108

Cause of Infarct

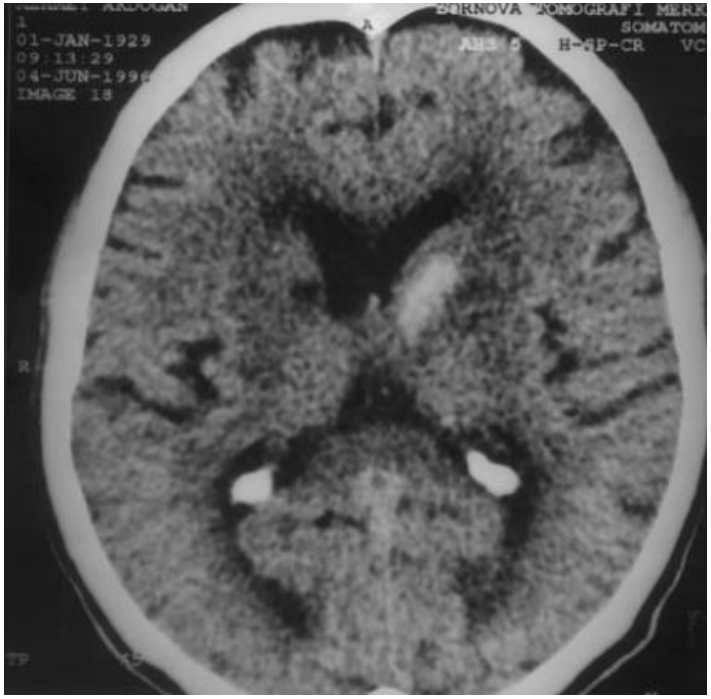
- Small infarction



Two cavitated small infarcts (arrow) in the body of the left caudate nucleus in a 67-year-old female shown on sagittal FLAIR (a), T1-weighted (b) and T2-weighted images (c) of the 7T MRI scan. These lesions are hypointense with a hyperintense rim on the FLAIR image, hypointense on the T1-weighted image and hyperintense on the T2-weighted image. Scale bar indicates 10 mm.

Caudate hemorrhages

- Hypertension
- Arteriovenous malformation
- No cause of hemorrhage
  - ❖Presentation with an altered level of consciousness (confusion-disorientation) abulia,headache,**nuchal rigidity** ,Motor deficit conjugated eye deviation, dysarthria and disconjugated eye deviation



doi.org/10.1161/01.STR.30.1.100Stroke. 1999;30:100–108

Caudate hemorrhages

TABLE 3. Risk Factors, Etiology, Clinical Features, and Prognosis of Patients With Caudate Hemorrhage

Patient No./ Age, y/Sex/ Hemorrhage Side	Risk Factors	Signs	Neuropsychological Findings	Nuclei Involved	Cause	Therapy	Outcome
26/78/M/R*	HT, DM	NR, headache, motor (face, UL, LL), CED	Visuospatial neglect, visual amnesia, depression	MCN, LCN, VCN, aic, SCS	HT	AE, AH	Dependent
27/57/M/R	HT	NR, headache	Confusion, abulia, disorientation	MCN, LCN, VCN	HT	AE	Independent
28/69/F/L*	None	NR, headache, dysarthria, motor (face, UL>LL), CED	Confusion, nonfluent aphasia	MCN, LCN, VCN, aic, antput	AVM	AE	Dependent
29/67/M/L	HT	Headache	Abulia, verbal amnesia, impaired conflictual tasks	MCN, LCN, VCN (L), MCN (R), old infarct	HT	None	Independent
30/41/M/L*	None	NR, headache, motor (face, UL>LL), disconjugated eye deviation, mydriasis	Abulia, nonfluent aphasia	MCN, LCN, aic	Unknown	AE	Dead (due to generalized vasospasm)
31/51/F/R	HT	Headache	Confusion, disorientation, restlessness	MCN, LCN	HT	AE	Independent

HT indicates hypertension; DM, diabetes mellitus; NR, nuchal rigidity; UL, upper limb; LL, lower limb; CED, conjugated eye deviation; SCS, subcallosal stratum; AE, antiedema treatment; AH, antihypertensive treatment; and AVM, arteriovenous malformation. Other abbreviations are as defined in Figure 1 and Figure 2 legends.

*Indicates patients with a score of ≤28 on the MMSE.

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Take home points

- Stroke can present as a chameleon
- The clinical presentation of patients with caudate hemorrhage mimicked subarachnoid hemorrhage with or without motor and neuropsychological signs.
- The behavioral abnormalities were mostly due to medial, lateral, and ventral caudate subnuclei damage and coexisting lesion of the anterior limb of the internal capsule.

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THANK YOU