

Clinical and neuroimaging features of stroke due to small vessel disease

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Disclosure statement

- DMC: Astra Zeneca (SOCRATES trial), Bayer (Navigate ESUS trial)
- Honoraria for presentations: Astra Zeneca, Bayer, Daiichi Sankyo
- No conflicts of interest related to this presentation

Learning objectives

- To learn the clinical features of stroke due to small vessel disease and
- To learn the specificity and sensitivity of clinical lacunar syndromes for small vessel disease
- To learn the neuroimaging evolution of infarcts due to small vessel disease, and differential diagnosis of other pathologies on neuroimaging

Lacunar infarcts/lacunar stroke – a major concept in cerebrovascular disease

- accounts for 20-25 % of all ischemic strokes
- the most common type of silent cerebral infarcts
- a major contributor to cognitive decline and dementia

Donnan, Norrving, Bamford, Bogousslavsky.
Subcortical Stroke, Oxford University Press,
2002

Lacunar infarct: definition

- Infarct due to presumed single perforator occlusion
- Characteristic clinical features
 - Pure motor hemiparesis
 - Sensorimotor stroke
 - Pure sensory stroke
 - Dysarthria clumsy hand syndrome
 - Ataxic hemiparesis

Donnan, Norrving, Bamford, Bogousslavsky. Classification of subcortical infarcts. In Subcortical Stroke, Oxford University Press, 2002

Are lacunar syndromes specific for small vessel disease?

- Most studies on lacunar stroke are based on CT scan findings
- Definitions vary: only patients with a visualized infarct, or also patients with normal CT scan findings

We think we see a patient with a lacunar stroke...
...what do we actually see?

Associations of clinical stroke misclassifications (“clinical-imaging dissociation”) in acute ischemic stroke

137 patients with a mild cortical or lacunar syndrome had an acute ischemic lesion on DWI.

21/93 (23%) with a cortical syndrome had an acute lacunar infarct

7/44 (16%) with a lacunar syndrome had an acute cortical infarct.

Acute small subcortical infarctions on diffusion weighted MRI: clinical presentation and aetiology.

93 patients with subcortical or brainstem DWI lesions <1.5 cm in diameter <7 days from the onset of stroke symptoms.

Only 41 (44.1%) patients presented clinically with a lacunar syndrome according to OCSP criteria.

Seifert et al. J Neurol Neurosurg Psychiatry. 2005 Nov;76(11):1520-4.

Comparison between OCSP subtypes and dw-MRI findings

Clinical features (and negative CT) very uncertain basis for diagnosis of lacunar infarct.

Positive predictive value for lacunar infarct from LACI subtype only 40-60 %

Asdaghi et al. Stroke 2011;42:2143-48

We think we see a patient with a lacunar stroke...
...but stroke cause often non-lacunar

”Lacune” – a sliding terminology

”Historically, the original small vessel disease feature was the “lacune” (hole), a small fluid-filled cavity.

By a process of medico-linguistic evolution,

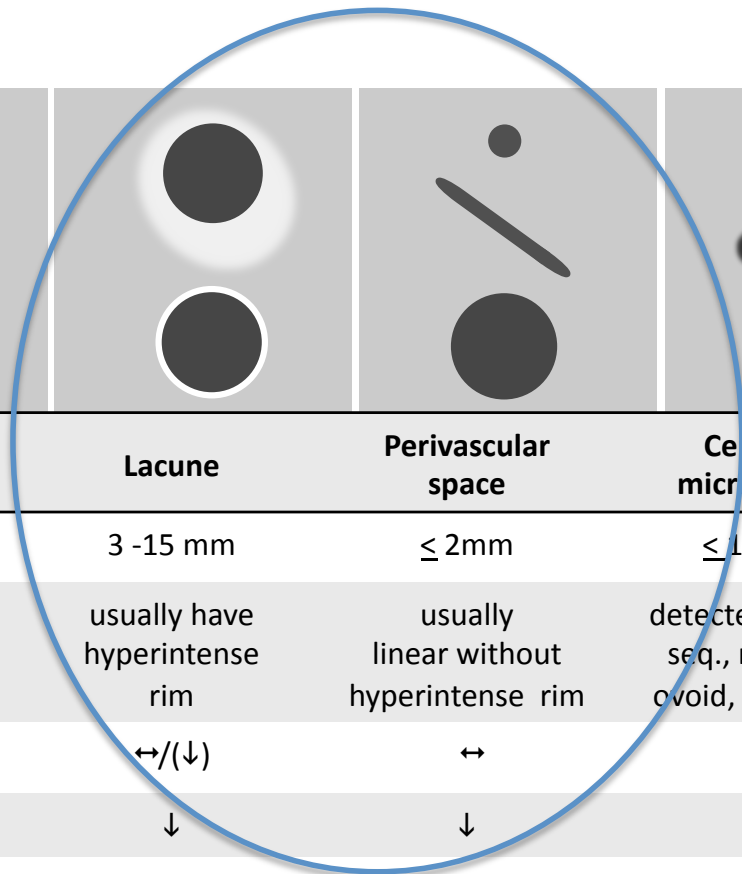
- the precavitary phase became the ***lacunar infarct***,
- the associated clinical entity became the ***lacunar stroke***,
- and the neurological features became the ***lacunar syndrome***”



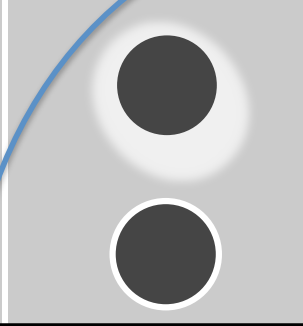
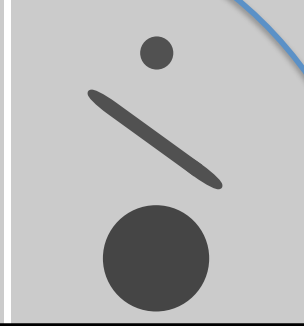
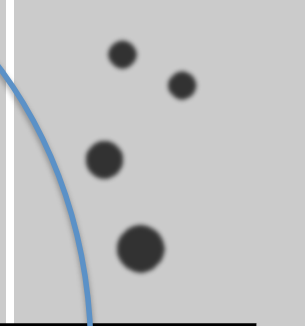
Fisher CM. Cerebrovascular Dis 1991;1:311-20

We think we see a lacune" ...
but what do we see?

Is a lacune always the result
of an old infarct?

Characteristics of SVD-related MR imaging findings



					
	Recent small subcortical infarct	White matter hyperintensity	Lacune	Perivascular space	Cerebral microbleeds
Usual diameter¹	≤ 20 mm	variable	3 -15 mm	≤ 2mm	≤ 10 mm
Comment	best identified on DWI	located in white matter	usually have hyperintense rim	usually linear without hyperintense rim	detected on GRE seq., round or ovoid, blooming
DWI	↑	↔	↔/(↓)	↔	↔
FLAIR	↑	↑	↓	↓	↓
T2	↑	↑	↑	↑	↓
T1	↓	↔/(↓)	↓	↓	↔
T2* / GRE	↔	↑	↔	↔	↓↓

(↓ if hemorrhage)

The Centers of Excellence in Neurodegeneration Vascular Imaging Standards Working Group. Lancet Neurology 2013;12:822-38

Do all symptomatic lacunar infarcts cavitate?

28-94 % of symptomatic lacunar infarcts cavitate:
definition, time interval, location, MRI sequence

Potter et al. Stroke 2010;41:267–272

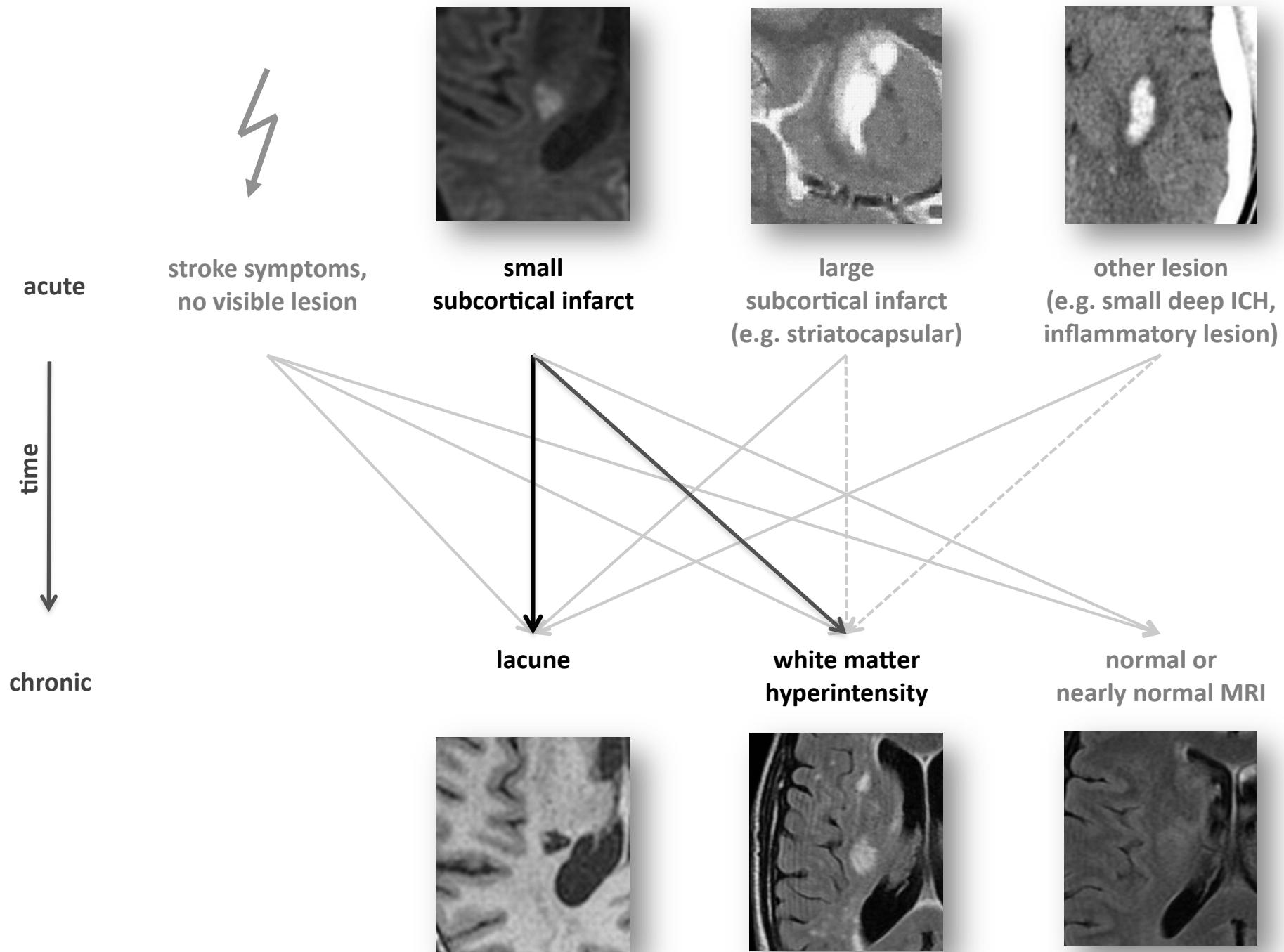
Moreau F et al. Stroke 2012;43:1837-42

Common late sequelae of acute small deep infarcts

Disappeared

Turned into WMH

Cavitated (lacune)



The Centers of Excellence in Neurodegeneration Vascular Imaging Standards Working Group. Lancet Neurology 2013;12:822-38

Silent cerebral infarcts. A review of MRI diagnostic criteria.

Zhu et al. Stroke 2011;42:1140-45

Silent cerebral infarcts



White Matter Hyperintensities

Cerebral microinfarcts: a recent addition to the SVD spectrum

- Not detected on conventional structural MRI
- Often cortical, <1 mm
- Up to 15 x (?) more frequent than "conventional" silent infarcts

We think we see a silent cerebral infarct...
... but there are caveats

- Symptoms may have been forgotten
- Infarct may have been minimally symptomatic
- May have been a TIA, or a TIA during sleep

May have been truly "silent" i.e. did not cause acute neurological dysfunction

Key messages

Major advances in lacunar stroke and small vessel disease

Clinical lacunar syndromes have low precision

Not all lacunar infarcts cavitate into a "lacune"

Not all "lacunes" are due to old lacunar infarcts

Some lacunar infarcts merge into WMD

Importance of silent cerebral infarcts increasingly recognized

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