CAROTID PSEUDO-OCCLUSIONS:
HOW ARE THEY BEST DIAGNOSED
AND TREATED
WHAT ARE THE RESULTS OF TREATMENT
AND NO TREATMENT

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NO DISCLOSURE

PSEUDO-OCCLUSION

Subtotal ICA stenosis
or short occlusions with
delayed filling,
hypoplastic distal ICA
< 3 mm (string sign)

ARCHIE 1994 – KNIEMEYER 1997

NEAR TO OCCLUSION
WITH STRING SIGN

- LOW INCIDENCE (0.5-2.3%)
- RISK OF MISDIAGNOSIS
- NO CONSENSUS ON TREATMENT STRATEGY

Literature review

DIAGNOSIS

- Duplex scanner (power-dopp)
- CEUS
- CT scan/MRI
- Selective angiography

Carotid artery pseudo-occlusion
with “string sign”

Duplex scanner requires the use of low-pulse
repetition frequencies and shows a thin artery
and a distant continuous audible signal with
filling in of the spectral waveform windows
with minimum or no pulsatile flow
Can contrast-enhanced ultrasound with second-generation contrast agents replace computed tomography angiography for distinguishing between occlusion and pseudo-occlusion of the internal carotid artery?

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Clinica 2015

Carotid pseudo-occlusion on CTA in patients with acute ischemic stroke: A concerning observation

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ARTICLE INFO
Objective: Differences between an embolic and a patient-oriented intracranial artery CTA is the basis for patientsselection for urgent carotid endarterectomy. We report our imaging and anatomic results in which CTA was used in an assessment of the results of total endarterectomy and the influence of the initial CTA results for endarterectomy selection. We describe for the first time, a concerning CTA finding of a carotid pseudo-occlusion that was overlooked in CTA studies.

This study, a single-center retrospective study, included 60 consecutive patients who underwent CTA for acute ischemic stroke. Of these, 10 patients had a carotid pseudo-occlusion. The prevalence of carotid pseudo-occlusion on CTA was associated with reduced time to treatment; however, in our experience, CTA is a more reliable technique for the evaluation of the carotid artery in patients with stroke.

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Time-Resolved 4-Dimensional Computed-Tomography Angiography Can Correctly Identify Carotid Pseudo-Occlusion

Felix C. Ng,6 MBBCh, FCA6, FCLC6, Mirosh Datta, MBBCh, FCLC, FRANZC,6 and Philip M.C. Choi, MBBCh, FRANZC,6

Correct identification of symptomatic high-grade intracranial carotid artery stenosis in patients with acute ischemic stroke is critical for patient selection for urgent carotid endarterectomy. Carotid pseudo-occlusion is a novel radiologic feature on non-invasive imaging that can lead to misclassification of total endarterectomy. Time-resolved four-dimensional computed tomography angiography allows for a more accurate assessment of the true extent of carotid stenosis.

In our study, the use of 4-dimensional computed tomography angiography to identify carotid pseudo-occlusion has not been previously reported. We identified carotid pseudo-occlusion on 4D-CTA—carotid endarterectomy—errant technical and clinical decisions.

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Perfusion-Derived Dynamic 4D CT Angiography Identifies Carotid Pseudo-Occlusion in Hyperacute Stroke

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ABSTRACT
Background: Differences between true acute occlusion and pseudo-occlusion involving the extracranial internal carotid artery (ICA) may lead to inappropriate selection and treatment of patients with acute ischemic stroke. The identification of pseudo-occlusion and the ability to distinguish between pseudo-occlusion and true occlusion are important to achieve optimal acute stroke treatment.

Methods: In a prospective cohort study of 37 consecutive patients with acute ischemic stroke enrolled within 4 hours of symptom onset, we compared the findings of a perfusion study and contrast-enhanced dynamic 4D-CTA in identifying pseudo-occlusion in CIAs.

Conclusions: 4D-CTA is a reliable technique for identifying pseudo-occlusion in the extracranial internal carotid artery. Our findings suggest that 4D-CTA may be accurately incorporated into an existing acute stroke neuroimaging protocol.

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MR Angiography at 3 Tesla to Assess Proximal Internal Carotid Artery Stenoses: Contrast-Enhanced or 3D Time-of-Flight MR Angiography?

Robert O. Weber1,2,3

Conclusion: Both 3D TOF-MRA and CE-MRA at 3 T are reliable tools for detecting high-grade proximal ICA stenoses (70–99%). 3D TOF-MRA might misclassify pseudo-occlusions as complete occlusions. If there are no contraindications for CE-MRA, CE-MRA is recommended as primary MR imaging modality.

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11/18/2016
ANGIOGRAPHY → “string sign”

Angiography is still the gold standard and is recommended in case of recurrent symptoms and diagnosis of ICA occlusion.

Carotid artery pseudo-occlusion

- Natural history:
  - Neurological symptoms ?
  - Artery functionally occluded ?
  - (2-8% carotid occlusion)

**LOW RISK OF STROKE EVEN FOR SYMPTOMATIC PATIENTS**


**LOW RISK OF STROKE EVEN FOR SYMPTOMATIC PATIENTS**

**However half of the NASCET patients (16) were treated**

**Outcomes Associated with Carotid Pseudo-Occlusion**

34 PTS

**Symptomatic carotid near-occlusion with full collapse might cause a very high risk of stroke**

10 PTS

![Graph showing outcomes associated with carotid pseudo-occlusion](image-url)
PROGNOSIS FOR ASYMPTOMATIC PSEUDO-OCLUSION HAS NOT BEEN STUDIED

TREATMENT

- INDICATIONS
  - SYMPTOMATIC
  - ASYMPTOMATIC AT HIGH RISK (associated lesions) ?

Carotid artery pseudo-occlusion

Open surgery does not have satisfactory results

Surgical treatment pseudo-occlusion

- Immediate occlusion: 5.9-25%
- 30 d-Mortality: 0-1.9%
- 30 d-Morbidity: 0-7.5%
- Restenosis: 4-12.2%


Carotid artery pseudo-occlusion

“High risk for CAS: Very tight string sign stenosis”
Fi Criado. Semin Vasc Surg 2008
**Endovascular Treatment for Near Occlusion of the Internal Carotid Artery**

30-Day Outcome and Long-Term Follow-Up

- 2004-2014 → 182 PTS → 52 string sign
- 44% asymptomatic
- Minor stroke 2.2%
- M. Infarction 1.1%
- Restenosis 3.8%

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**Carotid artery stenting in patients with near occlusion: A single-center experience and comparison with recent studies**

- 44% asymptomatic
- Minor stroke 2.2%
- M. Infarction 1.1%
- Restenosis 3.8%
- Technical success 95.8%
- Complications 4 17.4%
  - Hyperperfusion syndrome 2
  - MI 2

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**Endovascular treatment in patients with acute ischemic stroke and apparent occlusion of the extracranial internal carotid artery on CTA**

- 3000 acute stroke → 6 pseudo-occlusion
- 4 with assoc. intracranial ICA occlusion
- Mean NIHSS score 15
- Technical success 5/6 83.3%
- Death 1 6.7%
  - (preop 30% of infarction)

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**Carotid artery pseudo-occlusion**

Personal experience (2008-2016) 13 pts

- 13/1072 CAS 1.2%
- 6 men
- Age 63.9 (range 46-84)

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**Carotid artery pseudo-occlusion**

Personal experience 13 pts

- Minor stroke 1 *
- TIA 4
- Hypoperfusion symptoms 7 *
  - (syncope, dizziness, scintillating scotoma, glare)
- Contralateral stroke + sten 80% 1 *

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**Carotid artery stenting using the proximal or dual protection method for near occlusion of the cervical internal carotid artery**

- 14 near occlusion ICA (5.2% of the cases)
- Symptomatic 71.4%
- Flow reverse 100%
- Postop complications 0%
- Asymptomatic new MRI les 2 14%

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Carotid artery pseudo-occlusion

Personal experience (2008-2016) 13 pts

- 13/1072 CAS 1.2%
- 6 men
- Age 63.9 (range 46-84)
Carotid artery pseudo-occlusion protection devices
- Distal filters 4
- MoMa 7
- None 2

Carotid artery pseudo-occlusion
IMMEDIATE RESULTS
- Technical success 12 92.3%
- Mortality 0
- Morbidity 1 (TIA)

Follow-up 1-94 months
Patency 100%
No late neurological complications
Distal lumen enlargement during time

CONCLUSIONS
- SYMPTOMATIC CASES HAVE TO BE TREATED
- NO EVIDENCE SUPPORT TREATMENT FOR ASYMPTOMATIC
- CAS RESULTS SEEM SLIGHTLY BETTER THAN SURGERY IN TERM OF PATENCY