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# Carotid Near-Occlusion

Diagnostics, Pathophysiology and Risk of  
Recurrent Ipsilateral Ischemic Stroke

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## Academic dissertation

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**Abstract****Abstract****Background and aims**

Symptomatic carotid stenosis cause approximately 15% of all ischemic stroke. Carotid near-occlusion (CNO) is a severe carotid stenosis causing a diameter reduction (collapse) in the distal internal carotid artery (ICA). CNO accounts for approximately one-third of cases with symptomatic carotid stenosis. Despite its clinical relevance, CNO remains as an understudied condition in terms of diagnostics, pathophysiology and risk of recurrent stroke. The overall aim of this thesis is to advance the understanding of underlying pathophysiology behind stroke in CNO, targeting a potentially embolic mechanism. Moreover, we aim to evaluate the short-term risk of stroke and the accuracy of radiologists in identifying CNO using computed tomography angiography (CTA).

**Methods**

We conducted four studies using retrospective and prospective data from the "Transatlantic Carotid Near-Occlusion Study cohort" (TACNOS) and the "Umeå Carotid Cohort" (UCC). In the TACNOS cohort, we retrospectively reviewed medical records to assess short-term risk of recurrent ipsilateral ischemic stroke (study I) and routine CTA reports to evaluate the diagnostic accuracy of radiologists in identifying CNO on routine CTA (study II). In the UCC cohort, we prospectively assessed the incidence of microembolic signals (MES) on transcranial Doppler (TCD) distal to symptomatic CNO (study III), as a biomarker of embolic mechanism. By use of pooled TACNOS and UCC data, we further investigated the potentially embolic mechanism in CNO (study IV), by assessing the prevalence of ipsilateral intracranial middle- or large-vessel occlusions, defined as "ipsilateral presumed embolic vessel occlusions" (iPEVO) on CTA among patients with symptomatic CNO.

**Results**

In study I, 99 of 365 included patients had CNO (42 with full collapse and 57 without full collapse). The risk of recurrent ipsilateral ischemic stroke was 30% in symptomatic CNO with full collapse, 22% in symptomatic CNO without full collapse, compared to 15% in symptomatic conventional  $\geq 50\%$  carotid stenosis ( $p = 0.012$ ). The diagnostic accuracy of routine CTA for detecting CNO in clinical practice was strikingly low, with a sensitivity of only 8–20% (study II). Of 109 cases with TCD-recordings from the UCC cohort, MES incidence in study III was at least similarly high in symptomatic CNO (46%) compared to symptomatic conventional  $\geq 50\%$  carotid stenosis (27%;  $p = 0.08$ ) and significantly higher than asymptomatic  $\geq 50\%$  carotid stenosis (6%;  $p = 0.005$ ). Out of 124 cases with CTA on the same day following stroke onset, the prevalence of iPEVO in study IV was higher in symptomatic CNO with full collapse (89%) and without full collapse (44%) than symptomatic conventional  $\geq 50\%$  carotid stenosis (10%;  $p < 0.001$ ).

**Conclusions**

CNO is underrecognized in Sweden. The high short-term risk of recurrent stroke in CNO highlights the urgent need for enhanced education and diagnostic radiological methods. While the underlying mechanism of stroke in CNO appears to be at least partly embolic, further investigation is required to understand the potential role of concurrent hemodynamic factors to guide future treatment strategies.

**Keywords:** Carotid near-occlusion, carotid stenosis, stroke, diagnostics, computed tomography angiography, pathophysiology, mechanism, TCD, microembolic signals, cerebrovascular disease

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