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Effect of More Expedited Carotid Intervention on Recurrent Ischaemic Event Rate: A National Audit

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WHAT THIS STUDY ADDS

This population based study shows the benefit of reduced waiting time, from presenting event to carotid intervention, for symptomatic carotid artery stenosis. These results support efforts to reduce delays in the management of these patients, and illustrate that waiting time to intervention could be a useful quality indicator in clinical practice.

Background: The benefit of carotid endarterectomy (CEA) or stenting (CAS) for symptomatic stenosis depends on the timing in relation to the presenting event. As the risk of recurrent events is highest in the early phase, guidelines recommend a short delay. The purpose of this national audit was to study the effects of more expedient carotid intervention on the risk of recurrent ischaemic events.

Methods: Data on all CEA and CAS for symptomatic stenosis, including both recurrent ischaemic events during the waiting time to carotid intervention and peri-operative 30 day complication rates, were obtained from the Swedish Vascular Registry between May 2008 and December 2015. The National Prescribed Drug Registry provided data on preventive medication prior to hospitalisation with the presenting event. The primary endpoint was a recurrent cerebral ischaemic event occurring after the presenting event up to 30 days of post-operative follow up.

Results: A total of 6814 procedures for symptomatic carotid stenosis were studied. The proportion of recurrent ischaemic events, meaning all secondary events occurring after the presenting event up to 30 days follow up with inclusion of all pre- and post-intervention recurrences was recorded. These recurrent events decreased over time, from 31% in 2008–2009 to 21% in 2014–2015 ($p < .01$, chi-square test). In parallel, the median waiting time for carotid intervention decreased from 13 (IQR 6–27) to 7 days (IQR 4–12). Baseline demographic variables and comorbidities were similar during the study period. The proportion of pre-operative recurrences were reduced from 25% to 18% ($p < .01$, chi-square test) while the peri-operative stroke and/or death rate was 3.6%, and improved slightly during the study.

Conclusions: A substantial reduction in the secondary ischaemic event rate was observed when the median waiting time for CEA/CAS was reduced, and this was not counterbalanced by any increase in the peri-operative complication rate.

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INTRODUCTION

The overall benefits of carotid endarterectomy (CEA) or stenting (CAS) for symptomatic carotid stenosis decrease substantially if the intervention is delayed for more than 2 weeks after the presenting event.[1,2] Accordingly, most guidelines stipulate that carotid intervention (CEA or CAS) for symptomatic carotid artery stenosis should be performed within this time frame.[3–5]

Data also indicate that the risk of a recurrent ischaemic event is highest within the first days following the presenting ischaemic event,[6–10] which have catalyzed efforts to further shorten the delay to carotid intervention for patients with symptomatic carotid artery stenosis. However, the optimal timing of a carotid intervention in the context

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of a recently symptomatic carotid artery stenosis is still subject to debate. In the very early phase (<48 h) after an ischaemic event, the procedural risk may be increased,[11–14] while evolution in best medical therapy may have lowered the risk of a recurrent ischaemic event following the presenting ischaemic event.[15–20] The net patient benefit of very early carotid intervention is therefore still unclear. However, the major challenge for most centres treating these patients is to reduce the delay to intervention so that it falls within the stipulated two week time frame.

The purpose of this population based study was to assess temporal trends in the management of patients with recently symptomatic carotid artery stenosis undergoing carotid intervention, focusing on the risk of recurrent ischaemic events both before and after the intervention. It was hypothesised that changes in clinical practice with regard to surgical timing and secondary preventive pharmacotherapy have reduced the risk of a recurrent ischaemic event, when the whole treatment period is analysed; from the presenting event, continuing through the waiting time to carotid intervention, the peri-operative phase and ending at the 30 day follow up.

MATERIALS AND METHODS

Study design

This observational cohort study prospectively analysed data retrieved from the Swedish National Quality Registry for Vascular Surgery (Swedvasc). Data on all interventions (including both carotid endarterectomy and carotid artery stenting) for carotid artery stenosis registered in the Swedvasc from May 2008 to December 2015 were collected for the study. All interventions for symptomatic stenosis were identified and included in the analysis, whereas those for asymptomatic stenosis were excluded (i.e. symptoms >6 months previously or never symptomatic patients). As this cohort included only patients who underwent carotid artery intervention, data were not known on patients who might have died or suffered a severe secondary disabling stroke after the presenting event precluding carotid artery intervention.

Sweden has a population of approximately 10 million inhabitants.

Swedvasc registry

The Swedvasc registry has had national coverage from 1994 and all centres performing carotid endarterectomy (CEA) and/or stenting (CAS) report to the registry. The registry contains prospectively collected basic demographic data, comorbidities, risk factors and indications for the procedure, together with information on interventional details and peri-operative complications within 30 days follow up. Post-operative 30 day complication registrations are mandatory, and these follow up outcomes are reported by either vascular surgeons or by stroke physicians/neurologists according to the specific practice of each centre. Survival data in the Swedvasc are obtained through weekly cross match with the National Population Registry in Sweden, using the unique personal identity code of every Swedish citizen and permanent resident. This process safeguards the accuracy of all imputed data. The registry has repeatedly been validated with demonstrated high data accuracy for carotid interventions.[21,22] When symptomatic internal carotid artery stenosis is the indication for surgery, the date of the presenting ischaemic event is a mandatory variable. This presenting event is defined as the ischaemic event (i.e. stroke, TIA, or retinal ischaemia) that led to healthcare contact and subsequent referral for the carotid intervention. Another important variable in this study is the presence of any recurrent ischaemic symptom between the presenting event and carotid intervention. If present, the latest of such ischaemic events is registered, both with regard to date and type of event (i.e. major or minor stroke, TIA, or retinal ischaemia).

Since 2008, delay to carotid intervention has been included as a quality indicator for the registry, and the Swedish National Board of Health and Welfare implemented this indicator as a part of the National Performance Assessment of Stroke Care.

Outcomes

The primary endpoint in the study was recurrent ischaemic event, defined as a new ischaemic event occurring during the time period after the presenting event up to 30 days post-operatively, that is:

- any TIA, stroke, or retinal ischaemia occurring after the presenting event but before carotid intervention;
- any TIA, stroke, or retinal ischaemia occurring during the intervention up until 30 days follow up.

Peri-operative deaths within 30 days of follow up were also registered, and the mortality data are presented separately (Table 1) but were not included in the overall analysis for statistical reasons (as if death occurred after the presenting event, but before the carotid intervention, the patient would consequently not be entered into Swedvasc). Peri-operative strokes caused by intracerebral haemorrhage were included in the 30 day death/stroke rate, but are also presented separately.

Medical treatment

All patients in the Swedvasc cohort were crossmatched with the Swedish Prescribed Drug Register (SPDR), which has had full national coverage since 2005.[23] The SPDR includes data on dispensed prescribed drugs in terms of substance, formulation, amount, and date of administration. Drugs included in the analysis were; antiplatelets, anticoagulants and statins (ATC-code: B01AC, B01AA, B01AE, B01AF, C10AA).

The analysis included all dispensed drugs from Swedish pharmacies within three months before the presenting event, and drug adherence was described as the proportion of patients receiving the specific drug of interest during the

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