

Carotid Stenosis Treatment: Variation in International Practice Patterns

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WHAT THIS PAPER ADDS

The treatment of carotid stenosis is one of the best studied disease processes in vascular surgery, and several societies have published guidelines and recommendations about the indications for CEA and CAS. However, considerable variation exists between countries and centres. In this study, variation in the treatment patterns in over 400 centres in the United States, Europe, Australia, and New Zealand are analysed. The main focus is on indications and the proportion of stenting. Furthermore, an analysis on the influence of the reimbursement system on indications was performed.

Objectives: The aim was to determine current practice for the treatment of carotid stenosis among 12 countries participating in the International Consortium of Vascular Registries (ICVR).

Methods: Data from the United States Vascular Quality Initiative (VQI) and the Vascunet registry collaboration (including 10 registries in Europe and Australasia) were used. Variation in treatment modality of asymptomatic versus symptomatic patients was analysed between countries and among centres within each country.

Results: Among 58,607 procedures, octogenarians represented 18% of all patients, ranging from 8% (Hungary) to 22% (New Zealand and Australia). Women represented 36%, ranging from 29% (Switzerland) to 40% (USA). The proportion of carotid artery stenting (CAS) among asymptomatic patients ranged from 0% (Finland) to 26% (Sweden) and among symptomatic patients from 0% (Denmark) to 19% (USA). Variation among centres within countries for CAS was highest in the United States and Australia (from 0% to 80%). The overall proportion of asymptomatic patients was 48%, but varied from 0% (Denmark) to 73% (Italy). There was also substantial centre level variation within each country in the proportion of asymptomatic patients, most pronounced in Australia (0–72%), Hungary (5–55%), and the United States (0–100%). Countries with fee for service reimbursement had higher rates of treatment in asymptomatic patients than countries with population based reimbursement (OR 5.8, 95% CI 4.4–7.7).

Conclusions: Despite evidence about treatment options for carotid artery disease, the proportion of asymptomatic patients, treatment modality, and the proportion of women and octogenarians vary considerably among and within countries. There was a significant association of treating more asymptomatic patients in countries with fee for service reimbursement. The findings reflect the inconsistency of the existing guidelines and a need for cooperation among guideline committees all over the world.

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INTRODUCTION

Carotid artery disease has long been associated with ischaemic stroke. In the early 1990s, large randomised trials clarified the indications for carotid endarterectomy (CEA) treatment of symptomatic disease. Surgical intervention in patients with carotid artery stenosis of $\geq 50\%$ in the presence of symptoms was found to be highly beneficial, provided that the complication rates were low.^{1,2} Indeed, the absolute risk reduction of CEA compared with best medical treatment (BMT) in patients with 50–69% and 70–99% symptomatic carotid stenosis was shown to be 7.8% and 15.6% respectively.^{3,4} Carotid artery stenting (CAS) as a treatment modality for carotid stenosis has also been studied and compared with CEA. In a recent pooled analysis of 3433 randomised patients, CEA was safer in the short term than CAS because of the increased risk of stroke in CAS patients over the age of 70 years, although no difference was apparent in younger patients.⁵

Treatment of asymptomatic carotid stenosis is more controversial. In two large randomised trials with more than 4700 patients with asymptomatic carotid stenosis, the absolute risk reduction of stroke when CEA was compared with BMT was 5.3–5.9% after 5 years.^{6,7} Furthermore, in the 10 years since these trials, BMT has improved to the point where the annual stroke risk from asymptomatic stenosis is now estimated by some to be as low as 0.5%.⁸ Current guidelines regarding asymptomatic patients recommend careful patient selection, primarily offering CEA or CAS to those under 75 years of age⁹ or those with life expectancy more than 5 years.^{10,11}

Despite several randomised controlled trials (RCTs) being available, there are still differences between medical society guidelines regarding the treatment of carotid stenosis.¹² Registries provide a real world view and can demonstrate variation in how practice guidelines are translated into clinical practice.¹³ Registries also permit analysis of variation among different geographical regions and among centres. In a previous study, variation has been shown to exist between European countries, New Zealand, and Australia,¹⁴ but no centre level analysis has been performed.

The present study included data from 11 countries on three continents: Australasia, Europe, and North America. Variations in treatment of carotid artery stenosis were examined over a 4 year period (2010–2013). Trends were analysed in the treatment of asymptomatic versus symptomatic carotid stenosis and the distribution of treatment modality (CEA vs. CAS) for each patient group, focusing on variation among countries and among centres within countries. Data were analysed for difference in treatment among octogenarians and by gender. In asymptomatic patients the association of treatment and fee for service versus population based reimbursement was analysed. The authors sought to describe how actual practice compares with society guidelines in an international cohort of patients.

MATERIALS AND METHODS

To achieve these objectives, the International Consortium of Vascular Registries (ICVR, www.icvr-initiative.org) was formed in 2014 as a collaboration of the US Food and Drug Administration Medical Device Epidemiology Network (MDEpiNet) Science and Infrastructure Centre at Cornell University and 11 vascular registries from Australasia, Europe, and North America. This represents a collaboration of national registries in VASCUNET, based on the European Society for Vascular Surgery, and the Vascular Quality Initiative (VQI), based on the Society for Vascular Surgery. Registries contributing data to this ICVR project are from Australia, Denmark, Finland, Hungary, Iceland, Italy, New Zealand, Norway, Sweden, Switzerland, and the United States. De-identified individual patient data from 10 national registries and aggregated patient data from Italy were submitted to the Cornell Analytic Centre for analysis.

In six of the participating countries, registry is national, covering all hospitals in the country (Australia, Denmark, Hungary, Iceland, New Zealand, Norway, and Sweden). The Finnish registry captured all treatment from three hospital regions (Helsinki, South Savonia, and South Karelia). Italy and the United States captured all data from selected centres in voluntary national registries. Switzerland captured all procedures performed within their public but not private healthcare sector. Thus, data that are presented represent 15–100% of all procedures performed in the countries surveyed (Table 1). The percentage of CAS procedures enrolled was lower than CEA procedures because in

Table 1. The capture rate of the registers in the participating countries (comparison of number of procedures registered in the registry compared with the procedures registered in the official health dataset of the country).

	Registry coverage CEA	Registry coverage CAS	Number of the procedures included
Australia	70%	37%	8025
Denmark	> 95%	> 95%	1519
Finland ^a	40% (100%)	40% (100%)	938
Hungary	80%	60%	5388
Iceland	100%	100%	78
Italy	70%	40–50%	6937
Norway	80%	80%	1033
Sweden	> 98%	> 90%	4047
Switzerland ^b	50%	< 10%	1811
New Zealand	85%	< 5%	1478
USA ^c	15% (100%)	15% (100%)	27,353

AAA = abdominal aortic aneurysm; CAS = carotid artery stenting; CEA = carotid endarterectomy.

^a In Finland the registry is regional and covers 100% of the procedures in the regions, audited using hospital records.

^b The Swiss vascular registry includes patients undergoing surgery for AAA in public hospitals, and captures 85% of all open and 70% of all endovascular procedures in the country.

^c US data represent an estimated 15% of all CEA and CAS procedures over the study period. All participating centres capture 100% of their consecutive cases, audited using billing data.

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