

AN ASSESSMENT OF INTER-RATER RELIABILITY IN THE TREATMENT OF CAROTID ARTERY STENOSIS

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Contribution

AN & AA collected the data. AR & AA analysed the data and wrote the draft manuscript. This manuscript was reviewed by AA and JA modified accordingly. All authors have read and approved the final version of the manuscript. All authors contributed significantly to the submitted manuscript.

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ABSTRACT

Objective: To determine, through a retrospective case review, if different subspecialty physicians will make consistent therapeutic recommendations for Carotid artery stenosis.

Methodology: This retrospective cross sectional study included case review of patients with carotid stenosis presented to Guthrie Clinic Sayer, Pennsylvania, USA, from July 2004 to March 2005 . Case reviews of patients were presented to seven physician-raters specializing respectively in: Interventional cardiology (2), Vascular surgery (2), Neurology (2), or Interventional Radiology (1). Each physician reviewed cases independently and recommended a therapeutic option. The physicians were blinded to previous care provided. To test intra-rater reliability, two case-reviews were repeated.

Results: A total of 22 cases were reviewed . About 154 responses were obtained. Physician-raters recommended medical management 36% of the time, carotid artery stenting 32% of the times and carotid endarterectomy for 24% of the patients. Eight percent (8%) of the time, physicians made other recommendations, such as further diagnostic evaluation. Inter-rater agreement was 77% ($\kappa = 0.77$). Intra-rater reliability was 93 % ($\kappa = 0.93$).

Conclusion: A multi-specialty team providing care for carotid artery stenosis patients can reduce “turf battles” among various specialties, resulting in better care for the patients. High Intra-rater reliability of 93% points towards a scientific evidence based approach adopted across various specialties.

Key Words: Carotid Stent, Carotid Endarterectomy, Carotid Stenosis

INTRODUCTION

Stroke has become a leading cause of mortality and morbidity in the United States.^{1,2} Stroke is blamed for approximately 130,000 deaths in the United States each year which is approximately 1 out of every 20 deaths.³ Carotid artery stenosis is a major cause of ischemic stroke.¹ Approximately, 50% of all ischemic stroke patients have carotid artery stenosis.⁴ Two trials, the European Carotid Surgery Trial (ECST) and the North American Symptomatic Carotid Surgery Trial (NASCET), have shown that carotid endarterectomy (CEA) reduces the risk of stroke in symptomatic patients with severe carotid artery stenosis.^{5,6} Based on these findings, the American Heart Association concluded that CEA is beneficial for symptomatic patients with recent non-disabling carotid artery ischemic events and ipsilateral carotid artery stenosis of 70% to 99%.⁷

Despite its success, CEA is associated with significant perioperative risk.⁷ Realization of this risk has led to the introduction of carotid artery stenting (CAS) as an alternative to CEA. Recent large randomized trials suggest that the procedure can be performed with an acceptable complication rate.^{8,9} More recently, CAS has shown to have similar clinical results with CEA in multiple large randomized clinical trials.¹⁰ The SAPPHERE (Stenting and Angioplasty With Protection In Patients at High Risk for Endarterectomy) trial found no difference in 1-year stroke, death, and myocardial infarction (MI) in symptomatic patients, but CAS had a better outcome in asymptomatic patients (9.9% vs. 21.5%; $p = 0.02$) compared with CEA.¹¹ At 1 year, significantly more CEA patients required repeat revascularization (4.3% vs. 0.6%, $p = 0.04$) than CAS patients. At 3 years, there was no difference for major adverse cardiac events, death, or stroke.¹² For average risk surgical patients, CREST (Carotid Revascularization Endarterectomy Versus Stenting Trial) found no difference between CAS and CEA for the combined endpoint of stroke, death and MI or the rate of post-procedural ipsilateral stroke after 10 years of follow-up in 2502 randomized patients.^{13,14} In the CEA group, there was an excess of perioperative heart attacks, which was associated with a 3.5-fold increased risk of death (hazard ratio [HR] 0.50 [0.26-0.94]; $p = 0.03$) at 4 years.¹⁵

The Food and Drug Administration (FDA) approved the use of carotid stenting with embolic protection for the treatment of carotid artery stenosis in August 2004 in selective patient population. The American College of Cardiology and American Heart Association guidelines on management of patients with extracranial carotid and vertebral artery disease were updated in 2011. CAS was recommended as alternative to CEA in average-surgical-risk symptomatic patients provided the anticipated periprocedural risk of

stroke or mortality is $<6\%$.¹⁶ These guidelines were endorsed by 14 professional societies that included the American College of Radiology, the Society of Vascular Surgery and the Society of Vascular Medicine.

Introduction of CAS has been described as “perfect vascular storm”. With various interventional specialties (cardiology, radiology, or vascular surgery) laying their claim towards expertise in treating carotid stenosis patients, a team approach is highly desirable for optimal patient care. To avoid conflicts, a Carotid Stenting Procedural Clearance Process as a screening instrument in the selection of patients for carotid angioplasty and stenting has been introduced at performing institutions. The purpose of our study was to determine through retrospective case review, if different subspecialty physicians will make consistent therapeutic recommendations for carotid stenosis by assessing inter-rater reliability among various subspecialists. Inter-rater reliability also known as reproducibility is assessed when two or more persons measure the same item and their measurements are compared. Intra-rater reliability, the index of intra-observer variability that is obtained when one person measures the same item twice and the measurements are compared, was also assessed.

METHODOLOGY

This retrospective cross sectional study included case review of patients with carotid stenosis presented to Guthrie Clinic Sayer, Pennsylvania, USA. The case-reviews of patients with a primary diagnosis of carotid artery stenosis were presented to two interventional cardiologists, two vascular surgeons, two neurologists, and one interventional radiologist. Each physician was asked to review each case independently and make a therapeutic recommendation of care, which may have included either continued observation with medical management, carotid endarterectomy, carotid artery stenting, or another recommendation of their choice. Their recommendations were numerically coded and entered into a Microsoft Excel database.

Twenty patients were selected by a random skip pattern from a data set containing all patients diagnosed with carotid artery stenosis from July 2004 to March 2005 (identified by ICD/9 code 433.1). Patients with co morbid conditions were also selected for inclusion from this data set. In regards to their carotid artery disease, selected patients previously would have been treated either medically or surgically.

For each of the twenty patients selected, an individual case-review was written, summarizing the patient's health information such that a hypothetical recommendation of care could be made by each of the seven physician-raters. The raters were blinded to all identifying information as well

as previous care provided regarding their carotid artery disease. They were asked to base their decisions solely on the information presented to them. To test intra-rater reliability, two case-reviews were repeated within the total presented to the physician-raters.

Data was analyzed with SAS software. To assess inter-rater reliability, a kappa statistic was used. This is defined as the agreement beyond chance divided by the amount of agreement possible beyond chance. A kappa statistic quantifies the degree of agreement regarding a particular variable corrected for agreement by chance alone. A kappa value of one implies perfect agreement among raters, while a kappa value of zero suggests agreement is no better than that which would be obtained by chance. Interpretation of

intermediate values of kappa is shown in table 1.

RESULTS

Total of 22 case reviews were presented. In their one-hundred and fifty-four total responses, physician-raters recommended patients be managed medically 36% of the time, by carotid angioplasty and stenting 32% of the time, and by carotid endarterectomy 24% of the time. Eight percent (8%) of the time, physicians made other recommendations, such as further diagnostic evaluation. (Figure 1). A kappa-value of 0.77 (0.45, 0.88) was obtained for inter-rater reliability and 0.93 (0.36, 0.99) for intra-rater reliability (Figure 2).

Table 1: Kappa Statistics

$\kappa = 0.20$	Poor
$0.21 = \kappa = 0.40$	Fair
$0.41 = \kappa = 0.60$	Moderate
$0.61 = \kappa = 0.80$	Substantial
$\kappa > 0.80$	Good

Figure 1: Recommendations made by Raters

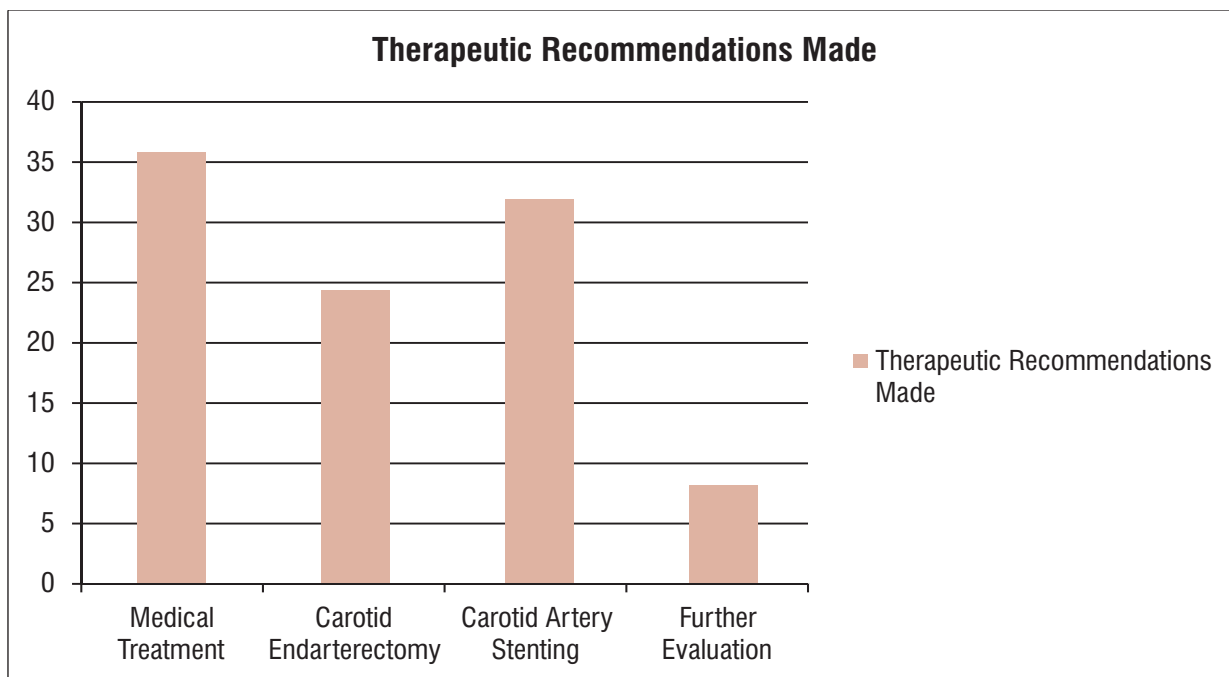
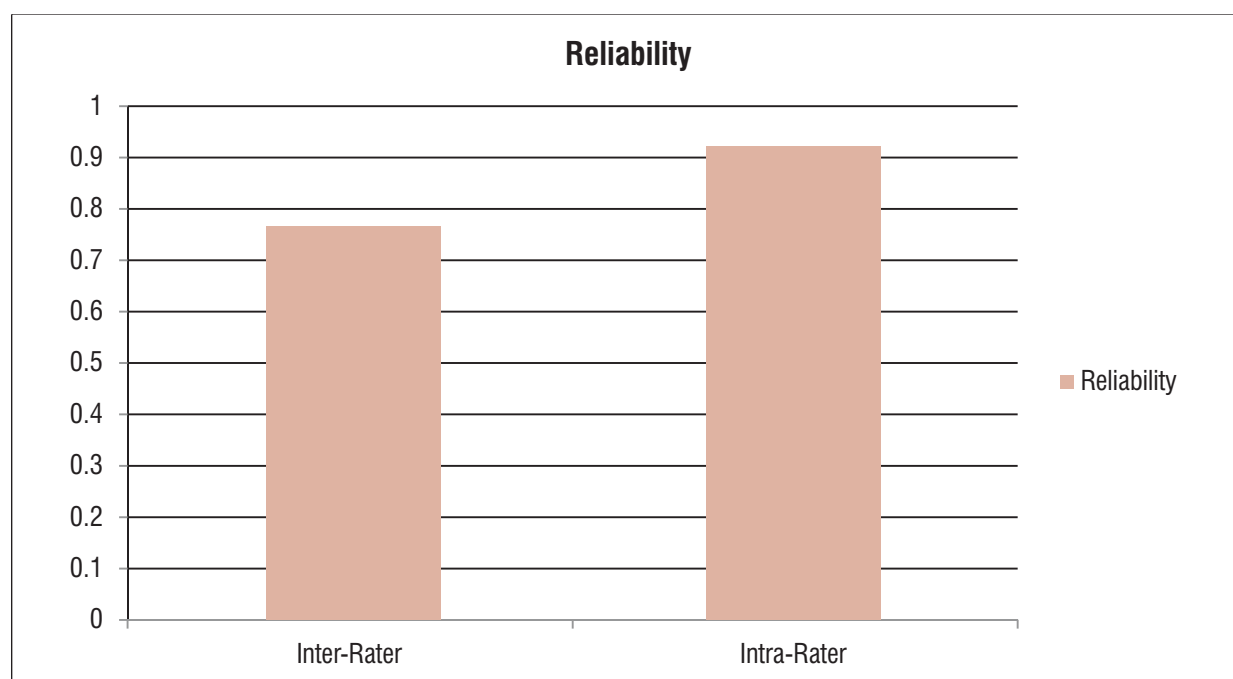


Figure 2: Inter- & Intra-Rater Reliability

DISCUSSION

In this group of twenty-two patients with carotid artery stenosis, previously managed either medically or surgically, physicians recommended carotid angioplasty and stenting 32% of the time, suggesting that a patient population exists in which this new procedure may be beneficial. In terms of inter-rater reliability, “substantial” agreement was found among all seven physician-raters in their therapeutic recommendations of care, suggesting that patients are receiving consistent care in the treatment of carotid artery stenosis. This also suggests the validity of the Carotid Stenting Procedural Clearance Process as a screening instrument in the selection of patients for carotid angioplasty and stenting. Lastly, it can safely be assumed that the physician-raters were accurate in their recommendations (intra-rater reliability), achieving a near-perfect kappa-value of 0.93.

The results of this study were highly unexpected. It was hypothesized that physicians would have poor agreement in their recommendations of care. Specifically, it was thought that physicians would be slightly biased toward a particular modality of treatment based on their specialty, thus affecting their final agreement. Instead, their recommendations were found to be consistent, suggesting that such bias may be rare than expected and majority of patients with carotid artery stenosis can receive optimal standards of care.

A multi-specialty team providing care for carotid artery stenosis patients can reduce the chances “turf battles”

among various specialties, thus resulting in better care for the patients. High Intrarater reliability of 93% points towards a scientific approach based upon evidence based medicine adopted by various specialties. Carotid Stenting Procedural Clearance Process once implemented can be used to identify candidates for this procedure at various institutions.

CONCLUSION

A multi-specialty team providing care for carotid artery stenosis patients can reduce the difference of opinions among various specialties, resulting in better care and reduced morbidity as well as mortality of the patients and it must be encouraged as much as possible .

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