

Overestimation of Carotid Stenosis by Visual Estimation in the Era of Carotid Stenting

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Accurate quantification of the severity of carotid stenosis has always been important to ensure that patients receive appropriate treatment for their condition, be that revascularization or antiplatelet therapy with serial surveillance scanning. Although that remains the primary motivator, the current regulatory landscape surrounding carotid angioplasty provides additional impetus to both accurately diagnose and document the severity of carotid stenosis present in patients undergoing carotid angioplasty and stenting (CAS). Those who have participated in any of the clinical trials of carotid stenting systems are well aware of the need to strictly document the severity of stenosis present, as well as the method of using the “electronic calipers” available on all contemporary digital radiographic systems to both measure and archive that information. Whether CMS, which has stated that it will pay for CAS only in patients who exceed specific stenosis thresholds, will require that level of accuracy in measurement is unknown, but presumably any angiographic image could be scrutinized and the stenosis accurately measured long after treatment was rendered. Since it has been common practice for physicians to eyeball their angiographic interpretations of the severity of stenoses, this new approach to the regulation of new technology by the restriction of reimbursement has the potential to put physicians at risk for demands of refunds to CMS, if not criminal prosecution.

We performed such a post hoc analysis of 200 recent carotid angiograms using a “digital calipers” computer program and compared both the intra- and interobserver measurements made by two vascular surgeons reading the angiograms in a blinded fashion on two separate occasions each. These measurements were then compared with those reported at the time of the diagnostic arteriography based on simple visual interpretation (SVI), commonly known as eyeballing. Intraobserver agreement within $\pm 5\%$ was a respectable 93%, validating the reproducibility of the digital caliper technique. Considering all measurements, however, interobserver agreement within 5% was only 45%, indicating either some variation in application of the digital caliper technique between the two vascular surgeons or that $\pm 5\%$ variation is too strict a threshold. Nonetheless, when analyzed with a $\pm 20\%$ threshold, interobserver agreement rose to 85%.

Interestingly, but not surprisingly, using the digital caliper measurement as the standard, SVI never underestimated the severity of carotid stenosis, perhaps revealing the bias of the surgeons performing the initial interpretation. In the computer-measured stenosis category of 16 to 49%, SVI would have placed the stenosis in a higher category 40 to 56% of the time. Likewise, in the 50 to 79% stenosis category, SVI overestimated the severity of stenosis into the 80 to 99% stenosis category in 30 to 44% of the cases. In the 80 to 99% category, SVI overestimated stenoses in 27 to 51% of the cases. Given the obligation to appropriately diagnose the severity of carotid stenosis, both to provide proper patient care and to meet current regulatory oversight, vascular surgeons should employ the digital caliper methodology available on all contemporary radiographic units.