Retrospective Study of a Series of 512 Cases of Carotid Artery Ultrasonography

Corresponding Author:
Dr. Genc Struga,
Neurologist, Service of Neurology, UHC Mother Theresa, Tirana - Albania

Submitting Author:
Dr. Gentian M Vyshka,
Lecturer, Biomedical, Faculty of Medicine, Rr Dibres 371 - Albania

Article ID: WMC002875
Article Type: Original Articles
Submitted on: 11-Jan-2012, 08:07:16 PM GMT Published on: 12-Jan-2012, 07:34:49 AM GMT
Article URL: http://www.webmedcentral.com/article_view/2875
Subject Categories: NEUROLOGY
Keywords: Carotid sonography, Stenosis, Risk factors, Stroke, Statins, Lacunar infarction.

How to cite the article: Struga G, Vyshka G M. Retrospective Study of a Series of 512 Cases of Carotid Artery Ultrasonography. WebmedCentral NEUROLOGY 2012;3(1):WMC002875

Copyright: This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Source(s) of Funding:
None

Competing Interests:
None
Retrospective Study of a Series of 512 Cases of Carotid Artery Ultrasonography

Author(s): Struga G, Vyshka G M

Abstract

Background: Carotid ultrasound is useful examination for prevention and management of ischemic stroke and atherosclerosis linked with vascular risk factors. Age and gender are independent factors for stroke. Lacunar stroke is more attributed to chronic hypertension, diabetes mellitus and alcohol abuse, while nonlacunar infarction to carotid artery stenosis and atrial fibrillation.

Methods: A retrospective case review study of patients that performed carotid ultrasound in our unit. The sample of data was retrieved from in-hospital admitted patients and outpatients. Data are expressed in average mean value and standard deviation. Data analysis was performed using the statistical software for social science SPSS 15.0. Significance was considered the values of $p < 0.05$. Among the cases under this study 110 cerebral nonlacunar infarction patients and 178 cerebral lacunar infarction patients who performed CT scanning and/or magnetic resonance imaging were examined for carotid artery stenosis and compare.

Results: According the coefficient of correlation Pearson, there is a significant statistical connection between age and the grade of carotid artery stenosis ($P = 0.001$). Test of student for two independent samples there is a significant statistical distinction between genders with male dominance in CAS ($t = 3.825$, df = 510, $P = 0.001$). Correlation was found with the grade of carotid artery stenosis: sharp rise in CAS between 50 and 60 years old) with the highest risk for stenosis and ischemic stroke at the age 65 and 75 years old. After the coefficient of correlation Kendall, there is a significant correlation between grade of carotid artery stenosis and smoking ($P = 0.001$), CAS and HTA ($P = 0.001$), CAS and diabetes ($P = 0.001$), CAS and high cholesterol ($P = 0.001$). According to the coefficient of correlation Kendall, there is not a significant correlation between grade of carotid artery stenosis and alcohol consumption ($N 512, P=0.03$). An important statistical difference between carotid artery atherosclerotic plaques in nonlacunar (55%, SD 17.83) versus lacunar infarction (35%, SD 14.57) ($p < 0.001$) was observed.

Conclusions: In patients with risk factors age between 40 and 60 years old is reasonable for screening with carotid ultrasound and follow up. There is a significant statistical distinction between genders with male dominance. Age, smoking, hypertension, cholesterol and diabetes are significant risk factor for CAS. Alcohol consumption has not significant correlation with grade of carotid artery stenosis. The carotid stenosis is more evident in nonlacunar compare to the lacunar cerebral infarction. This evidence is in favour that in lacunars stroke there is a distinct lacunar small cerebral arteriopathy relatively sparing medium sized carotid arteries.

Introduction

Common consensuses exist in all protocols about the role of carotid ultrasounds for primary and secondary prevention of ischemic cerebrovascular accidents and introductions of medical treatment or invasive interventions.

Epidemiologic data were obtained in prospective study of patients which performed ultrasounds of carotid artery ambulatory or hospital in patients using B-Mode modalities, Doppler and colour flow for primary and secondary intervention.

The purpose was to obtain conclusion for prevention, management and diagnosis of cerebrovascular ischemic disease and give appropriate recommendations.

Epidemiologic data were registered from patients who performed sonography examination of the carotid artery for primary and secondary prevention.

Patients would be hospital inpatients or from outpatients clinic, epidemiologic data would include age, gender, diagnosis and risk factors, carotid stenosis. Further study would be the follow up of such patients and reaction of them from treatment in parameters as morphology of plaque and plaque volume as reliable index of efficacy of treatment.

The patient’s records were prepared in particular formularies and further procedure the registered data were applied in statistical software for social science saved in PC hardware.

The propose of study is to achieved a statistically important sample of data which would be compare as much as possible from different sources with the propose to retrieve a statically unique evidence. To
indicate a statically important study were used statistical indexes as coefficient of correlation Pearson, test of student to compare independent groups of data, coefficient of correlation Kendall to compare the grade of carotid stenosis with vascular risk.

**Results**

The overall statistical result indicated the role of age in development of atherosclerosis in carotid arteries as independent factor of vascular risk. In this retrospective study of our patient were included n(512) patients was shown an important statistic increase of sharp rise between 40 and 45 years of age, the increase according our experience was attributed to patients with vascular risk factors.

In our study the analyses of the factors was evident a statically important difference between genders female and male with prevalence in males of carotid stenosis (t = 3.825, df = 510, P = 0.001) beside in male the rate of progression was more significant.

The role of arterial hypertension in development of atherosclerosis is been considered in many studies. In our study were taken in consideration hospital inpatient and outpatients where the hypertension was evident in 339 cases from 512 patients under the study. The data was analysed using the statistical software for social science SPSS 15.0, where statistically important were consider values of p < 0, 05. Statistical evidence of coefficient of correlation Kendall was statistically evident the role of high cholesterol particularly in patients with high index of total cholesterol with high density lipoproteins has an important role in development of atherosclerosis of carotid arteries (37).

In our study were taken under consideration inpatient and outpatients with high cholesterol based on biochemical laboratory results evident in 130 cases from 512 patients. Data was analysed using the statistical software for social science SPSS 15.0. Statistical results using coefficient of correlation Kendall was statistically evident the role of high cholesterol in development of atherosclerotic carotid disease and ischemic stroke (P=0.001).

The role of alcohol abuse is described as risk factor in development of small artery disease and lacunar stroke. Patients were questioned about the unit of alcohol intake where consider abuse of consumption intake of more the one unit a day.

According our study of outpatient and impatients abuse of alcohol consumption was evident in 84 case from 512 patients under the study. Data was analysed using the statistical software of social science SPSS 15.0, where statistically important were consider values of p < 0, 05.

According the coefficient of correlation Kendall was evident that Alcohol abuse has a statistical not important role in development of atherosclerosis of carotid arteries (N 512, P=0.03)

In a comparative study of different entities of stroke, the carotid artery atherosclerosis was compared in nonlacunar versus lacunar stroke. Lacunar stroke is more attributed to chronic hypertension, diabetes mellitus and alcohol abuse while nonlacunar stroke is attributed to atherosclerosis of carotid arteries and atrial fibrillation.

The sample of data was retrieved from in hospital admitted patients and out patients. Data are expressed in average mean value and standard deviation. Data analysis was performed using the
Stroke and transient cerebrovascular ischemia may arise as a consequence of several mechanisms that originate in atherosclerotic extra cranial cerebral arteries, including 1) embolism of thrombus formed on an atherosclerotic plaque, 2) atheroembolism, 3) thrombotic occlusion resulting from plaque rupture, 4) dissection or subintimal hematoma, and 5) reduced perfusion resulting from stenotic or occlusive plaque

(1)(2)

Patient age increased risk of ischemic stroke (adjusted hazard ratio per decade increase 1.45; 95% CI, 1.26 to 1.66), serious bleeding (1.61; 1.47 to 1.77), and cardiovascular events (1.43; 1.33 to 1.53).(3) Patient age was associated with an increased likelihood of previous stroke or TIA (OR per increased decade, 1.21; 95% CI, 1.11 to 1.32), hypertension (1.07; 1.02 to 1.12), and congestive heart failure (1.25; 1.17 to 1.33).(3)

The risk of these events was independently increased by a history of previous cerebrovascular events, diabetes, and hypertension. Patient sex appeared to have opposite effects on outcomes with males being less likely to experience stroke but more likely to experience cardiovascular events

Significant differences in baseline characteristics to the disadvantage of older patients were present in all studies. Compared with younger patients, older patients had a 3.09-time (95% CI = 2.37–4.03; P < 0.001) higher 3-month mortality and were less likely to regain a “favourable outcome” (OR = 0.53; 95% CI = 0.42–0.66; P

Annual stroke rate was 1.3% in patients with carotid stenosis less than or equal to 75% and 3.3% in those with stenosis greater than 75%. Ipsilateral stroke rate was 2.5% in patients with greater than 75% carotid stenosis. Annual cardiac event rate was 8.3% and death rate 6.5% in patients with severe carotid stenosis.

Doppler ultrasonography, which is readily available and non-invasive, is usually the first diagnostic imaging tool used to screen for carotid artery stenosis. However, it is highly dependent on operator experience and skill. When compared with catheter angiography, Doppler ultrasonography has a sensitivity of 86% and a specificity of 87% for the detection of hemodynamically significant carotid artery stenosis. (2)

A separation between symptomatic and asymptomatic carotid artery stenosis is critical. The importance of how the patients will be treated with medical treatment or with invasive procedures will be based in accurate definition of what category is symptomatic and who is asymptomatic. We consider symptomatic in case that patient with carotid stenosis has a transitory or permanent focal neurological deficit to ipsilateral retina as transitory or permanent vision loss or cerebral hemisphere symptoms. Symptoms of carotid artery stenosis include ipsilateral transient visual obscuration (amaurosis fugax) from retinal ischemia; contralateral weakness or numbness of an arm, a leg, or the face, or of a combination of these sites; visual field defect; dysarthria; and, in the case of dominant (usually left) hemisphere involvement, aphasia. In daily clinical practice, carotid artery stenosis is found in many patients during evaluation of ill-defined episodes of “dizziness,” generalized subjective weakness, syncope or near-syncope episodes, “blurry vision,” or transient positive visual phenomena (such as “floaters” or “stars”). These nonspecific symptoms in patients with carotid artery stenosis do not qualify as symptomatic ischemic events; these patients are considered asymptomatic even in the presence of high-grade carotid artery stenosis. (2)

Carotid artery occlusion may be suspected because of ultrasonography results, but it should be confirmed with non-invasive or invasive angiography, especially in symptomatic patients. For an occluded carotid artery, invasive treatment has no role except in the cases of a few carefully selected patients.

In patients with symptomatic carotid artery disease, CEA is effective in preventing future ipsilateral ischemic events, provided that the perioperative combined risk of stroke and death is not higher than 6%.

The observation that the risk of ipsilateral stroke is much higher in the first few weeks after a qualifying TIA than it is later has important therapeutic
implications. To maximize the benefit of surgery, treatment should be performed on an urgent basis after a TIA. Pooled analysis of the RCTs suggested that the benefit from CEA was maximal in patients who had the operation within 2 weeks of a qualifying event. In fact, the benefit of treatment was lost in women when treatment was delayed more than 2 weeks.(3) For many symptomatic patients an intensive medical treatment may be the most appropriate therapeutic option. Hypertension should be treated to maintain blood pressures consistently below 140/90 mm Hg except for patients with diabetes mellitus or kidney disease, in whom blood pressures should stay below 130/80 mm Hg. Currently, it is unclear whether certain antihypertensive agents may be more effective than others in reducing the progression of carotid atherosclerosis; therefore, the presence of co-morbid conditions and the cost should guide agent selection. (3)(5)

Lipid-lowering therapy should preferentially include a statin and should aim to achieve a low-density lipoprotein cholesterol value of less than 100 mg/dL. For patients with numerous vascular risk factors or coexistent symptomatic coronary artery disease, a target value of less than 70 mg/dL may be preferable. Smoking cessation is imperative, and any necessary counselling and medical therapies for smoking cessation should be used. Diabetes screening is necessary for all patients with carotid atherosclerosis, and patients with diabetes should be treated. Patients with asymptomatic carotid artery stenosis should be treated with aspirin. No proof exists of added benefit due to combining aspirin with extended-release dipyridamole or with clopidogrel for asymptomatic carotid artery stenosis. Patients with aspirin allergy should be treated with clopidogrel alone. Aspirin plus clopidogrel is appropriate for patients with concomitant symptomatic coronary artery disease, recent coronary stenting, and severe peripheral arterial disease. (7)

A regular program of aerobic exercise (>30 minutes on 5 or more days per week) should be initiated, along with a diet low in saturated fat, to maintain a body mass index (calculated as the weight in kilograms divided by the height in meters squared) of less than 25 kg/m2. In addition, all patients with documented carotid artery disease should be instructed about stroke symptoms (especially but not exclusively symptoms expected in accordance with the side affected by the stenosis) and about the importance of seeking immediate medical attention if symptoms occur.

Identification of asymptomatic patients who are at increased risk of stroke would improve the yield of prophylactic invasive treatment. Predictors of increased risk of ipsilateral ischemic events in asymptomatic patients with carotid artery stenosis are the following: a stenosis of increased severity, a progressive stenosis, a history of contralateral symptomatic carotid artery stenosis, and increased serum creatinine concentrations. Early reports suggest that detailed imaging may allow identification of carotid plaques that are more likely to cause symptoms. However, these studies are preliminary and require confirmation.

The criterion standard for invasive treatment of carotid artery stenosis is CEA. Recently, CAS has been proposed as a valid alternative to CEA. Compared with CEA, it has the advantage that it can be done with the patient under mild sedation, requires no incision, carries no risk of cranial nerve palsy, and has fewer cardiovascular complications. Over the years, CEA has been shown to be safe (when done by operators with acceptably low morbidity and mortality outcomes), effective in preventing ipsilateral strokes, and durable (i.e., a low incidence of re-stenosis). For its acceptance as a valid alternative to CEA, CAS must fulfil the same criteria of safety, effectiveness, and durability.

It was thought that the CAS procedure, being less invasive than CEA, could be advantageous for older patients. However, paradoxically, subgroup analyses of prospective studies have consistently shown that greater age is associated with a higher risk of peri-procedural morbidity and death after CAS but not necessarily after CEA. After CAS, symptoms that are recent (within 2 weeks of the procedure) are also associated with increased complication rates. (8)

A meta-analysis of published RCTs indicated that the risk of stroke within 30 days of the intervention was slightly higher in the CAS than the CEA group. However, the long-term (2-3 years) effectiveness of CAS in preventing ipsilateral ischemic events is supported by randomized studies showing that the long-term incidence of ipsilateral strokes is not different between CAS and CEA. Data on the incidence of re-stenosis are preliminary, but re-stenosis rates reported after CAS are relatively low. More importantly, most re-stenosis are asymptomatic and therefore of unclear clinical importance. Moreover, it is likely that re-stenosis rates may decrease as the stent technology continues to improve. (9)(10)

**Conclusion(s)**

Atherosclerosis of carotid arteries in particular and intracranial arteries is an important factor responsible...
for ischemic stroke. The enormous role of stroke in mortality and morbidity but also the high costs of health system indicate the very important role of primary intervention.

The experience in this field and statistical evidence suggest that is reasonable to exam with carotid ultrasound and TCD patients with vascular risk factors to make evident the initials damage of carotid wall through the measurement of intimae media index.

Taking in consideration the correlation of age with carotid stenosis and the sharp rise of graphic curve in 40es, the examination of such patients and modification of risk factor has primary role in prevention of ischemic stroke but also for motivation of such patients to modify their style of life.

Patient more exposed to risk are males which have even higher progression of atherosclerotic plaque in time. The role of risk factor as age, smoking, high cholesterol and diabetes is evident among other vascular risk factors. While the role of alcohol abuse is not as evident of atherosclerosis of carotid arteries, is a risk factor for lacunar and hemorrhagic stroke.

Studing the difference in carotid atherosclerotic disease in lacunar and nonlacunar stroke, the conclusion is in favour that in lacunars stroke there is a distinct lacunar small cerebral arteriopathy relatively sparing medium sized carotid arteries therefore the approach and treatment might differentiate.

Patients with degenerative disease M. Parkinson and Alzheimer dementia have less atherosclerotic carotid artery involvement compare with other patients, although the difference between these diagnostic entities is not significant, a tendency was noted of more atherosclerotic carotid involvement in patients with Alzheimer dementia considering a concomitant of vascular atherosclerotic disease in such patients.

Reference(s)


6. Cerebrovascular Ultrasound in Stroke Prevention and Treatment; Edited by Andrei V. Alexandrov; 2011.


9. Niten Singh, MD, Assistant Professor of Surgery, Uniformed Services University of the Health Sciences; Chief of Endovascular Surgery, Atherosclerotic Disease of the Carotid Artery. Madigan Army Medical Center 2010.

Illustrations
Illustration 1

Figure 1

Age groups and the grade of carotid stenosis
Illustration 2

Figure 2

Age and gender correlation with carotid artery disease using coefficient of correlation Pearson and Test of student for two independent samples respectively.

<table>
<thead>
<tr>
<th></th>
<th>GR_STENO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Pearson Correlation, .493</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.001</td>
</tr>
<tr>
<td>N</td>
<td>.512</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th>N</th>
<th>Mean</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GR STENO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MALE</td>
<td>357</td>
<td>37.5210</td>
<td>3.525</td>
<td>510</td>
<td>.000</td>
</tr>
<tr>
<td>FEMALE</td>
<td>155</td>
<td>29.7742</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Illustration 3

Figure 3

Main risk factors correlation with carotid artery disease using coefficient of correlation Pearson. Correlation is significant at the .05 level (2-tailed)

<table>
<thead>
<tr>
<th>Kendall's tau_b</th>
<th>GR_STENO</th>
<th>Correlation Coefficient</th>
<th>HTA</th>
<th>SMOKING</th>
<th>Alcohol</th>
<th>DIABETES</th>
<th>Hyper cholesterol</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>-0.339</td>
<td>-0.293</td>
<td>-0.084</td>
<td>-0.146</td>
<td>-0.130</td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.001</td>
<td>.001</td>
<td>.030</td>
<td>.001</td>
<td>.001</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>512</td>
<td>512</td>
<td>512</td>
<td>512</td>
<td>512</td>
<td>512</td>
<td></td>
</tr>
</tbody>
</table>
Disclaimer

This article has been downloaded from WebmedCentral. With our unique author driven post publication peer review, contents posted on this web portal do not undergo any prepublication peer or editorial review. It is completely the responsibility of the authors to ensure not only scientific and ethical standards of the manuscript but also its grammatical accuracy. Authors must ensure that they obtain all the necessary permissions before submitting any information that requires obtaining a consent or approval from a third party. Authors should also ensure not to submit any information which they do not have the copyright of or of which they have transferred the copyrights to a third party.

Contents on WebmedCentral are purely for biomedical researchers and scientists. They are not meant to cater to the needs of an individual patient. The web portal or any content(s) therein is neither designed to support, nor replace, the relationship that exists between a patient/site visitor and his/her physician. Your use of the WebmedCentral site and its contents is entirely at your own risk. We do not take any responsibility for any harm that you may suffer or inflict on a third person by following the contents of this website.