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Recognizing Asymptomatic Patients with Carotid Arterial Stenosis in Primary Care

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PERMISSION

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Department Nursing

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Date 4/7/2015

Abstract

Stroke incidences continue to decline due to advances in medical therapy. Recognizing patients symptoms is one way to ensure these patients with carotid artery stenosis (CAS) do not have an ischemic stroke. Although asymptomatic CAS patients are at high risk for stroke and can have a decreased quality of life, if not caught prior to an ischemic stroke. Primary care providers need to recognize the asymptomatic population at high risk for suspected CAS. The patient in the case report was symptomatic with amaurosis fugax of the right eye. Without this symptom, this patient, based on his history, could have been screened for carotid artery stenosis based on the evidence found in the literature review. The three databases that were searched included Cumulative Index to Nursing and Allied Health Literature (CINAHL), Google Scholar and PubMed. The search was limited to articles published within the last 8 years, although one article was included that was older than 8 years since the information is relevant to the context of the case report. The majority of the studies concluded the following risk factors are indicative of suspected carotid artery stenosis (CAS) is asymptomatic patients: hyperlipidemia, current smoker or history of smoking, hypertension, coronary artery disease, diabetes, family history of CAS or ischemic stroke, hypothyroidism, decreased fruit consumption and physical activity throughout lifespan, male gender and/or over 65 years of age. This information will ensure that asymptomatic patients will be screened for CAS and can ensure a continued decline in stroke incidences.

Keywords: carotid artery stenosis (CAS), screening for carotid arterial stenosis and arterial disease.

Background

Stroke incidences have been declining over the past decade due to advances in medical therapy. On average approximately one American dies from a stroke every four minutes and strokes kill almost 130,000 Americans each year (Center for Disease Control and Prevention, 2015). Primary providers also have helped with the decline in stroke by recognizing patient symptoms and risks for developing carotid arterial disease. In the primary care setting, educating patients on modifiable risk factors also supports the decrease in stroke prevalence. It is the role of the primary provider to recognize modifiable risk factors in asymptomatic patients at high risk for carotid stenosis and to implement appropriate screening and/or referral to decrease cerebral vascular accident (CVA) incidences.

The case report describes a patient who did have a classical symptom of carotid stenosis. If the primary care provider did not recognize that symptom, the patient could have eventually had a CVA and could have needed more medical care possibly affecting his quality of life. The primary care provider did recognize the patient in the case report did have amaurosis fugax as a potential symptom of carotid stenosis. Patients who are asymptomatic or present with non-classical symptoms of CAS need to be recognized to reduce incidence of stroke.

The literature review will discuss research articles on the risk factors for developing carotid stenosis. This information can be used to educate primary care providers about patients who need proper screening and referral to decrease CVA incidences. The literature review will also examine the current screening guidelines recommended for carotid stenosis.

Case Report

D.A. is a 67 year old male patient that was referred to vascular surgery by his primary provider, Dr. Berntson, for right eye amaurosis fugax, acute left jaw numbness and tingling, and

acute left arm weakness occurring 2-3 months ago. Symptoms did not last for more than one minute. D.A. had a carotid angiogram on 2/5/2015 that showed moderate to severe right carotid stenosis. The patient underwent a right carotid endarterectomy on 2/9/2015.

D.A. presented to the clinic accompanied by his wife on 2/16/2015, concerned about the swelling in his neck since his right carotid endarterectomy on 2/9/2015. He stated the swelling in his neck had not improved since surgery and there is a hardness around the incision site. He denies any difficulty swallowing, breathing, fever or drainage from the incision site. Patient denies headache, vision changes, dizziness, nausea and vomiting. D.A. stated he does not have any muscle weakness to his left side and denies left sided jaw numbness/tingling. Denies any pain at this time and states his jaw is still slightly numb from the surgery but his sensation is coming back. He does state since his surgery he has had point tenderness to the back of his left heel. He can walk on it but it is painful. His two week post-operative appointment is scheduled for 2/16/2015.

Current medications include bisoprolol-hydrocholothiazide 10-6.25mg orally daily, pravastatin 80mg orally at bedtime, and aspirin 81mg chewable tablet orally daily. Patient has no known allergies.

Past medical history of D.A. includes carpal tunnel, hypertension, dyslipidemia, and carotid artery stenosis. Past surgical history includes left carpal tunnel release of unknown date, carotid angiogram on 2/5/2015, and carotid endarterectomy on 2/9/2015.

Family history includes father having a stroke in his 60's, died at age of 82 from unknown cause and mother had a history of hypertension, died at 65 years of age from heart disease. Sister is currently living and does have type II diabetes mellitus.

D.A. is married to his wife and they have no children. He has a history of smoking one pack per day for 25 years and quit sixteen years ago. He and his wife are primary caregivers for his mother-in-law. D.A. is a retired automation technician from the University of North Dakota.

Review of systems is as follows: negative for chills, fatigue or fever, no recent weight gain or loss. D.A. denies blurred vision, denies peripheral, superior or central vision loss. D.A. also denies shortness of breathing, difficulty breathing and denies cough. Asking D.A. about his cardiovascular system, and he denies chest pain, pressure or palpitations. D.A.'s gastrointestinal status is unremarkable and he denies abdominal pain, diarrhea and constipation. Also denies nausea and vomiting. The patient does state it is difficult to walk due to heel pain but denies joint pain and swelling. He does have point tenderness to the back of his left heel, denies redness or swelling to the left heel. D.A. states he does not have weakness to extremities, denies vision changes, and denies numbness or tingling except around surgical incision to the right neck.

Physical examination: Blood pressure 139/59, pulse 64, temperature 96.4 °F (35.8 °C) (tympanic), respiratory rate 16, height 5'4.5", weight 201 lb 8 oz (91.4 kg). Generally D.A. is alert and is in no acute distress. His head is normacephalic and atraumatic. Right neck does have a hematoma and ecchymosis around the incision with no drainage observed. Patient's right neck is firm without warmth to palpation. D.A.'s oropharynx is pink and moist, able to move tongue side to side without fasciculation and trachea is midline with no deviation. D.A.'s neck has full range of motion laterally, with forward flexion and with extension. Pupils are round, equal and reactive to light and accommodation. Extraocular eye movements are symmetrical. D.A.'s lungs are clear throughout anterior and posteriorly. No bruit auscultated of the right and left carotid. D.A. has a regular heart rate and regular rhythm, no murmurs auscultated. The patient's extremities have no cyanosis or edema and bilateral pedal pulses palpable. Tender to

palpation to left posterior heel and the skin is intact to left heel with no swelling or redness. Full range of motion of bilateral ankles and knees. Sensation intact to bilateral feet with no numbness or tingling. D.A. has bilateral equal strength hand grasp and speech is clear with no slurring. He is able to shrug his shoulders against resistance. The patient's facial movements are symmetrical with no facial droop. Bilateral patellar reflex intact.

Assessment based on the subjective and objective data is stable right carotid endarterectomy incision with stable hematoma and left heel pain. Differential diagnosis regarding the neck swelling include incisional site infection, carotid restenosis, and cervical hematoma. Differential diagnosis regarding the heel pain include tendinitis of posterior tibialis, Achilles tendinopathy, and retrocalcaneal bursitis.

The plan will be to see patient on 2/16/2015 as scheduled for two-week post-operative appointment. The patient was instructed to return or call the clinic with any further concerns regarding his incision or hematoma or if patient develops signs of infection as evidenced by fever, drainage from incision site, redness and increased swelling. If patient is experiencing heel pain at the next appointment will refer to orthopedics. Take ibuprofen and ice heel as needed for pain.

Literature Review

Searching three databases came up with an abundant amount of literature articles related to classical and non-classical symptoms of carotid stenosis that warranted screening in certain patient populations. The three databases that were searched included Cumulative Index to Nursing and Allied Health Literature (CINAHL), Google Scholar and PubMed. Out of those databases, 33 abstracts were reviewed and ten articles were kept after the full review of the abstracts. A combination of terms were used in the search and those terms included the

following: carotid artery stenosis (CAS), screening for carotid arterial stenosis and arterial disease. The search was limited to articles published within the last 8 years, although one article was included that was older than 8 years since the information is relevant to the context of the case report.

Arterial disease in high risk patients' needs to be identified in the primary care setting and properly treated. Brott et al. (2011) identified causes thought to disrupt the flow of blood through the carotid arteries to the brain. The causes of blood flow disruption include the atherosclerotic plaque embolism, embolism of cholesterol crystals or other artheromatous debris, plaque rupture resulting in acute thrombotic occlusion, structural damage of the arterial wall from hematoma, and increased plaque growth causing stenosis or occlusion of the cerebral blood flow. Brott et al. (2011) developed current guidelines on management of patients with carotid artery disease, as follows:

- Class I recommendation for asymptomatic patients with known or suspected carotid stenosis should have a duplex ultrasonography (US) to detect carotid stenosis (level C evidence) (Brott et al., 2011).
- Class IIa recommendation states it is reasonable to perform duplex US to identify carotid stenosis is asymptomatic patients with a carotid bruit (level C evidence) (Brott et al., 2011). Class IIa recommendations also state it is rational to repeat the duplex US annually to detect the progression of the stenosis (level C evidence).
- Class IIb recommendations state to complete a duplex US on asymptomatic patients with symptomatic peripheral arterial disease (PAD), coronary artery disease (CAD), or atherosclerotic aortic aneurysm (Brott et al., 2011). Although

with the additional diagnosis of carotid stenosis in these patients it is difficult to know if medical treatment would actually affect clinical outcomes. Duplex US can be considered to identify carotid stenosis in asymptomatic patients without clinical evidence of atherosclerosis having 2 or more of the risk factors: hypertension, hyperlipidemia, tobacco smoking, family history of first degree relative of atherosclerosis that developed before the age of 60 years, or a family history of ischemic stroke (Brott et al., 2011).

- Brott et al. (2011) state a carotid duplex US is not recommended for routine screening in asymptomatic patients with no clinical signs/symptoms or risk factors. Duplex US is not recommended for patients with neurological or psychiatric disorders unrelated to cerebral ischemia (level C evidence).

Brott et al. (2011) recommendation guidelines do not suggest any screening based on age and is relying solely on patients with an established diagnosis of vessel disease and/or risk factors. The only clinical manifestation addressed in the guidelines was carotid bruit and symptomatic patients with PAD, CAD, and atherosclerotic aortic aneurysm. Patients who are asymptomatic with unknown PAD, CAD and atherosclerotic aortic aneurysm are at extreme increased risk for ischemic stroke caused by carotid disease.

Qureshi et al. (2007) screening guidelines were developed by a committee from the American Society of Neuroimaging and Society of Vascular and interventional Neurology. These guidelines recommend not screening the general population based on age, gender or any other variable. Although Quershi et al. (2007) does recommend screening patients over 65 years of age with at least three cardiovascular risk factors of hypertension, CAD, current tobacco smoker or hyperlipidemia. Interestingly Quershi et al. (2007) considered screening the general

population for carotid stenosis in community health events needs to be further investigated to see if the benefit of the screening outweighs the risk. Quershi et al. (2007) further explains screening can be considered for patients undergoing a coronary artery bypass grafting (CABG) (grade D recommendation) but should be done if the CABG patient is 65 years and older with a history of stroke, transient ischemic attacks (TIAs), left main coronary stenosis, peripheral vascular disease (PVD), history of smoking, carotid bruit, history of carotid surgery or diabetes mellitus (DM) (grade B recommendation).

Quershi et al. (2007) does not recommend screening patients with asymptomatic or symptomatic PVD, abdominal aortic aneurysm (AAA) and patients with renal artery stenosis. Quershi et al. (2007) also addresses screening is not recommended for patients with an isolated event of syncope, dizziness, vertigo or tinnitus. Performing an ultrasound on patients following a carotid endarterectomy is not beneficial because restenosis is rare. Quershi et al. (2007) state the optimal time to do an ultrasound is unclear but the studies show it should be conducted between 3 and 18 months post-carotid endarterectomy.

Based on the guidelines by Brott et al. (2011), carotid endarterectomy should be conducted on patients with 60% to 90% carotid stenosis with a perioperative stroke/death risk less than 3%. Paraskevas et al. (2014) concluded that patients with certain criteria could benefit from carotid intervention with a CEA or carotid stents. Paraskevas et al. (2014) identified six parameters that increased a patient's incidence of a future stroke and based on that increased risk, the patient should undergo a carotid intervention. The parameters identified by Paraskevas et al. (2014) putting general population at high risk for stroke are as follows: transcranial Doppler detection of microemboli, unstable carotid plaque identified by ultrasound, reduced cerebral blood flow reserve using transcranial Doppler velocity measurements, magnetic resonance

imaging (MRI) detection of intraplaque hemorrhage, brain computed tomography (CT) or MRI identifying silent embolic infarcts, and severity progression of arterial carotid stenosis. These predictive parameters of stroke were developed by Paraskevas et al. (2014) after an extensive literature review. Identifying predictable parameters of stroke can help justify the need for carotid screening and intervention in asymptomatic patients. These parameters were not based on patient risk factors but on evidenced-based practice through numerous research studies. The above parameters conclude that general population should not be screened for CAS to reduce stoke incidence.

A prospective study done by Jacobwitz et al. (2003) screened for CAS in the general population who were at least 60 years of age and had at least one of the following risk factors: history of CAD, hypertension, current smoker, and family history of stroke in a first degree relative. The screening included a modified vs. standard duplex scan, electrocardiogram rhythm strip, and blood pressure. Modified and standard duplex study examined 166 carotid arteries. There were 16 arteries with over 50% stenosis identified using both the modified and standard duplex scans (Jacobwitz et al., 2003). Of the modified scans, there were five false negatives, and no false positives. Both types of scans showed less than 50% carotid stenosis in 145 carotid arteries.

Independent of the duplex scans, screening for stroke was done in 394 participants, 38 patients had unilateral or bilateral artery stenosis of over 50% (Jacobwitz et al, 2003). The average age of the participants was 71.3 years of age and 31.9% were men. The study concluded the increased number of risk factors increase the percentage of carotid stenosis. The two highest risk factors associated with CAS was hypercholesterolemia and being a current smoker. Interestingly, the study done by Jacobwitz et al. (2003) concluded a family history of stroke was

associated with a decrease of occult carotid stenosis. This would assume the risk of developing CAS is dependent on risk factors. The study did show, of general population having no risk factors, 1.8% had a prevalence of carotid stenosis (Jacobwitz et al, 2003). The low prevalence of CAS in the general population does not warrant screening.

Reviewing a cohort study done by Khaleghi et al. (2014) does show family history is associated with CAS. The study included 864 participants with CAS and 1698 controls. The control group did not have CAS or a history of any cerebrovascular disease or coronary heart disease. Family history of stroke was higher in the participants with CAS when compared to the control group. The prevalence of CAS in the participants with a family history of coronary heart disease was 50.6% versus 33.7% prevalence in the control group (Khaleghi et al., 2014). This study clearly shows a family history is a risk factor for CAS and may have a genetic link.

de Weerd et al. (2014) developed a severity prediction stenosis score chart by collecting data from four population based cohort studies. The reason for the prediction score chart was to identify the general population who would benefit from screening for asymptomatic CAS. de Weerd et al. (2014) made sure the general characteristics of each study were similar. The characteristics included age, sex, diabetes mellitus, history of coronary and cerebrovascular disease, and data on medication usage. de Weerd et al (2014) concluded the general population at high risk for developing over 70% stenosis of the carotid artery are over 70 years of age, male gender, systolic blood pressure over 140, diastolic blood pressure less than 75, total cholesterol to high density lipoprotein (HDL) ratio over five, diabetic and current smoker. Using the prediction stenosis score chart can be beneficial to use in the primary care setting for patients with asymptomatic CAS to eliminate the potential for future stroke.

Currently the United States Preventative Services Task Force (USPSTF) (2014) has a D recommendation, therefore is against screening asymptomatic adults for CAS. Contrary to the USPSTF recommendation, a systematic review and meta-analysis was done by Jonas et al. (2014) to evaluate whether screening adults for asymptomatic CAS reduces the risk for stroke and reduces the harm associated with screening and interventions for CAS.

The results of the 78 article meta-analysis done by Jonas at al. (2014) concluded several findings. For the discussion of this paper, only two findings will be addressed regarding screening and harms of screening. One finding of the review concluded there is no thorough evidence suggesting screening for asymptomatic CAS reduced the prevalence of ipsilateral stroke. The other conclusion of the review done by Jonas et al. (2014) found no studies were done on the anxiety or emotional state among patients with false-positive results from a duplex ultrasound. Regarding harms from an angiogram, only two studies reported strokes following the angiogram (Jonas et al., 2014). The prevalence of stroke was 1.2% and of the 414 patients in that particular study, only one patient died from a stroke following the angiogram (Jonas et al., 2014). Overall Jonas et al. (2014) meta-analysis and systemic review concluded the same decision as the USPSTF, the overall harms of screening asymptomatic adults with CAS outweigh the benefit.

Every article reviewed up to this point has been prospective and not retrospective when reviewing what high-risk population should be screened for CAS. A prospective cohort study done by Juonala et al. (2010) took into consideration of life-time risk factors for developing carotid atherosclerosis in the young adult population. The cohort study started in 1980 which consisted of 1809 participants who were followed for 27 years, the baseline age was 3 to 18 years. The results of the study were done by measuring the carotid intima-media thickness

(IMT) in 2001 and 2007, while taking into consideration each individuals cardiovascular risk factors throughout their life span. Interestingly Juonala et al. (2010) concluded that the top two individual childhood risk factors for an accelerated, increased carotid IMT over the 6 year change in adulthood, was infrequent fruit consumption and low physical activity. Taking this study into consideration, looking back on a patient's childhood fruit consumption and physical activity could help identify high risk asymptomatic CAS patients.

An independent risk factor for developing hyperlipidemia is hypothyroidism. This is important to consider as a risk factor for developing CAS. Valentina, Marijan, Chedo, and Branka (2011) performed a cohort study that assessed subclinical hypothyroidism (SCH) and effects of carotid atherosclerosis. This study took 69 patients with newly diagnosed SCH and matched outcomes with 30 patients without SCH. The SCH was defined in the study as a normal free thyroxine level and an elevated thyroid stimulating hormone above 4.2 mU/L. The participants in the study had lipid panels assessed and also had carotid intima-media thickness measured. The results of the study concluded that SCH is associated with an increase in carotid intima-media thickness and an increase in carotid plaques, independent of other classical risk factors for atherosclerosis (Valentina et al., 2011). This conclusion solidifies that patients with SCH are at high risk for carotid stenosis and that SCH should be inclusion criteria for screening for CAS.

A degree of declined cognitive function from CAS could be a symptom that warrants screening a patient. A prospective exploratory study was done by Everts et al. (2014) to assess the cognitive and emotional effects in CAS patients. This study had a total of 68 CAS patients with blockage of over 70%. The subjects had executive function, language, verbal/visual memory, motor speed, anxiety and depression assessed. The evidence of this study concluded

that 30% of the patients showed deficiency in processing speed. Patients with bilateral stenosis showed the slowest processing speed. The study did reveal that the participant's cognitive domain was not affected by the degree of stenosis. Asymptomatic patients with CAS had significantly faster processing speeds than compared with symptomatic patients (Everts et al., 2014). As for anxiety, participants with CAS did have an increased anxiety level when compared to the normative sample. The study done by Everts et al. (2014) determines that patients with decreased processing speed and increased anxiety may have 70% blockage and should be considered for screening.

Learning Points

- The only physical examination finding that is discussed in a patient with suspected carotid artery stenosis is a carotid bruit. Primary care providers must rely more on a patient's risk factors to justify screening asymptomatic, high risk population to eliminate stroke incidence.
- Based on the following literature review asymptomatic patient's with suspected CAS should be screened with a duplex US with at least 3 or more of the following risk factors:
    - Hyperlipidemia
    - Current smoker or history of smoking
    - Hypertension
    - Coronary Artery Disease
    - Diabetic type I or II
    - Family history of CAS or ischemic stroke
    - Subclinical hypothyroidism
    - Decreased fruit consumption and physical activity throughout lifespan

  - Male gender
  - Over 65 years of age

- Anxiety and decreased cognitive function can be a sign of CAS but is too broad of a sign to ensure that screening outweighs the benefit and is not a reliable indicator of the degree of stenosis.

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