Carotid Dissection: A Stroke of Insight into Safer Work Conditions

by Natalia Turkiewicz

A 51-year-old man was admitted to hospital on the basis of dysarthria, left-side facial paralysis, pharyngitis, proximal loss of vision, left-arm paresis, and asphyxiation. Through various neurological testing, the patient was confirmed to have an ischemic stroke caused by an arterial dissection with a subintimal hematoma in the area of the carotid artery (carotid dissection). The patient was released from the hospital 3 days after being admitted with post-incident treatment instructions to ensure recovery.

In this case study, detailed clinical assessments, radiological findings, and therapeutic interventions will be reviewed to provide a holistic understanding of the patient's journey from injury to recovery. Through a meticulous analysis of real-life patient care, this thesis aims to help highlight the early symptoms of strokes and their impact on individuals, particularly those in physically demanding and dangerous work conditions, such as the patient, who worked as a roofer. By shedding light on the unique challenges faced by individuals in such occupations, I seek to contribute to the growing body of knowledge in stroke medicine. Ultimately, the goal is to improve clinical management and outcomes for individuals affected by carotid dissection while advocating for safer working conditions for those at risk.

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A dissection is characterized as "a tear of the inner layer of the wall of an artery" (*Carotid Dissection*, n.d.). A dissection can occur to the carotid artery, known as a "carotid artery dissection." The carotid is a major artery that carries blood from the heart to the head. There are two of them, one on each side of the neck (each splits into two branches) (*Definition of Carotid Artery* - NCI Dictionary of Cancer Terms, n.d.). This condition, characterized by tearing of the inner lining of the carotid artery, causes blood to get into the layers of the artery walls and separates them, causing blood flow to the brain to stop. Such an order of events can activate the body's clotting system, by leaking blood into the arterial wall, decreasing blood flow and increasing the risk of a stroke (Campellone et al., 2023). This can cause a transient ischemic attack (TIA) or stroke (*Carotid Dissection*, n.d.). The condition is caused by extraneous strain on the neck area, either through car accident, intense exercise, or heavy lifting (Evbayekha et al., 2023). In certain cases, carotid artery dissection can heal on its own, but other times it leads to compromised blood flow to the brain. It is a significant medical concern with the potential to cause a stroke. While carotid dissection can occur in various demographics, certain occupations, particularly those involving physically demanding tasks, may harbor unique risk factors predisposing individuals to this condition.

In construction, where workers often engage in strenuous activities such as lifting heavy objects, bending, and overextending, the potential for carotid artery dissection may be heightened, yet remains unexplored. This is a facet that warrants further investigation. By delving into this aspect of occupational health, we can gain valuable insights into individuals' unique challenges in physically demanding professions and implement targeted preventive measures to mitigate the risk of vascular complications.

In this paper, I aim to explore the intersection between construction work and carotid artery dissection, shedding light on the potential occupational risk factors and the need for further research in this domain. By identifying and addressing these occupational hazards, we can strive to promote the health and safety of construction workers while advancing our understanding of vascular health in physically demanding professions.

Case Presentation

In this examination, a 51-year-old married individual and occupational roofer in the construction industry suffered from a carotid dissection. The patient was admitted to the hospital on March 19, 2019. The patient is 6 feet tall and weighs two hundred fifteen pounds. The individual currently resides in Brooklyn, New York.

On February 18, 2019, the patient suffered from an incident at work. He was working with roofing rubber, an extremely heavy roofing material, taking one roll at a time to the area that needed attention. At a certain point he went to pick another one up. It seemed as though this one was heavier. Consequently, he yanked on it with extreme exacerbation. Afterwards, he noticed they were stuck together. This exacerbation caused him to strain his neck and was likely the cause of the carotid dissection.

Indeed, the day of the incident, he began to experience a feeling of pharyngitis[1] and episodes of asphyxiation.[2] These symptoms localized to the left neck area proximal to the clavicle, with exacerbation noted during eating and drinking. Conversely, the pain experienced by the patient was slightly relieved through resting, although it never fully diminished. These symptoms lasted the entire time until the patient was hospitalized, with increasing discomfort daily. The day before being admitted to the hospital, March 18, 2019, the patient began to experience facial paralysis on the left side, as well as, left arm paresis.[3] The next day, March 19, 2019, the patient began to experience temporal hemianopia[4] and dysarthria.[5] The onset of these symptoms caused the patient to call an ambulance, and ultimately led to his hospitalization.

The patient had a past medical history of hypertension.[6] His mother also had hypertension. His father died from a myocardial infarction.[7] His brother had a brain aneurysm and suffers from epilepsy.[8]

To understand the patient's lifestyle, detailed information was compiled to shed light on critical aspects of his daily routine. Understanding the patient's alcohol history, the initiation of alcohol consumption dates back to his 18th birthday. Presently, the patient engages in social drinking, primarily at gatherings occurring approximately once a month. Turning to the smoking history, the patient stated he is a former smoker. He used to smoke a pack of cigarettes daily for twenty years, starting on his 19th birthday, but after 20 years he quit, and presently does not smoke. In terms of exercise, the patient's occupation was extremely physically demanding. His physical activity involved work six times a week, in 10-hour work shifts. His exertions predominantly revolved around the challenging tasks associated with roofing, encompassing roof repair, replacement, and installation with materials of substantial weight, such as metal, aluminum, wood, shingles, tiles, slate, steel, cement, and clay. The patient has an inconsistent amount of sleep, depending on where he is working at the time; however, he tries to get approximately seven (7) hours per night.

Considerations

Upon the patient's admission to the hospital, the healthcare team had to assess the patient's symptoms thoroughly to consider potential differential diagnoses. The observed clinical manifestations prompted the exploration of several plausible scenarios. Given the patient's occupation as a roofer and the incident at work, the primary

[1] Pharyngitis = sore throat

[2] Asphyxiation = choking

[3] Paresis = weakness leading to the continuous dropping of objects

[4] Temporal hemianopia = loss of peripheral vision in one eye

[5] Dysarthria = slurred speech

[6] Hypertension = high blood pressure

[7] Myocardial infarction = heart attack

[8] Epilepsy = brain disorder causing repeated seizures

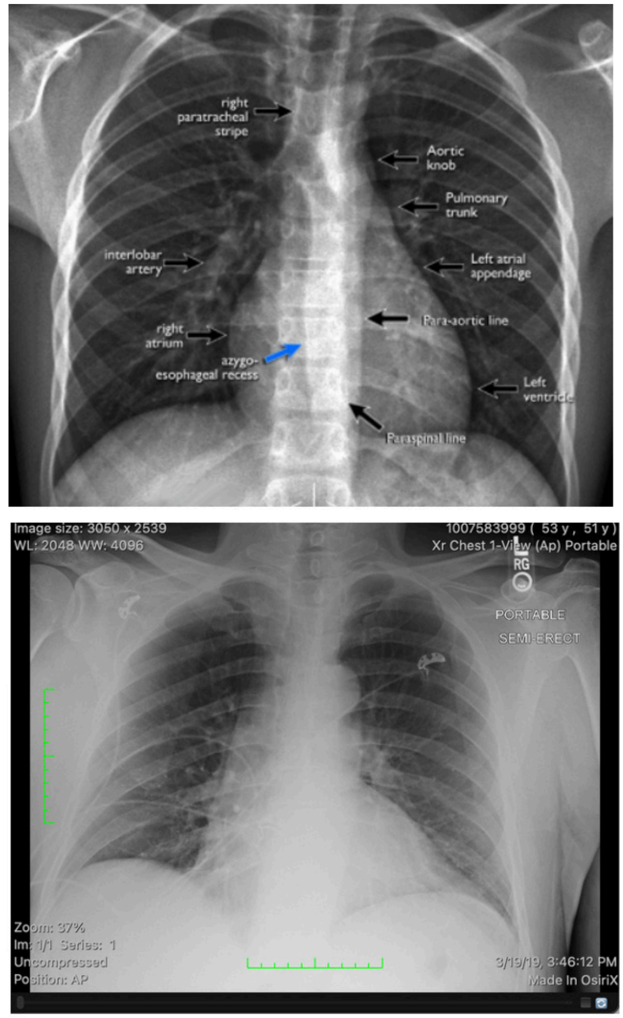
hypothesis was an ischemic stroke.[9] The neurological symptoms, including dysarthria, facial paralysis, and temporal hemianopia, aligned with this possibility and necessitated a comprehensive examination of vascular factors. The possibility of a hemorrhagic stroke[10] was also contemplated, given the abrupt onset of certain symptoms and the nature of the patient's work involving physical exertion. This hypothesis warranted a meticulous examination of imaging studies to discern any signs of bleeding. Additionally, the patient's profile and symptoms raised the possibility of a cerebral aneurysm,[11] particularly with the reported asphyxiation episodes. Further imaging and neurovascular assessments were imperative to ascertain or dismiss this potential diagnosis. A final hypothesis was a myocardial infarction, given the patient's family history, age, and the presence of symptoms such as dysarthria and left arm paresis. This differential diagnosis framework guided the subsequent investigations, allowing for a systematic approach to unraveling the underlying cause of the patient's symptoms.

Final Diagnosis

One laboratory exam and five neuroimaging techniques were used to make the patient's final diagnosis—chest x-ray, CT scan, CTA, MRI, MRA, and lipid panel. All diagnostic tool images and values were analyzed by the physician. All patient images provided in the case study were obtained from the patients' records with permission from the patient.

The chest x-ray that was deemed normal as it showed no focal consolidation,[12] pleural effusion,[13] pneumothorax,[14] or radiographic evidence of acute intrathoracic[15] abnormality (Figure 1).

Figure 1: *Chest X-Ray*[16]



Note. The image on the top is an example of a normal Chest X-ray. The image was borrowed from (*Chest X-Ray - Basic Interpretation*, n.d.). The image on the bottom is the patient's chest x-ray that was also deemed normal.

The CT scan showed no loss of gray-white matter, as well as no acute intracranial[17] hemorrhage[18] or extra-axial[19] collection (Figure 2). There was no midline shift, hydrocephalus,[20] or herniation.[21]

[9] Ischemic stroke = blood supply to part of the brain is blocked

[10] Hemorrhagic stroke = a blood vessel in the brain leaks causing bleeding in the brain

[11] Cerebral aneurysm = a weak spot on an artery that balloons and fills with blood

[12] Focal consolidation = when air in the airways of the lungs is replaced with a different material

[13] Pleural effusion = accumulation of fluid in the pleural cavity

[14] Pneumothorax = collection of air within the pleural cavity (outside the lung)

[15] Intrathoracic = in the thorax

[16] See Appendix A for more details

[17] Intracranial = within the skull

[18] Hemorrhage = bleeding from a blood vessel

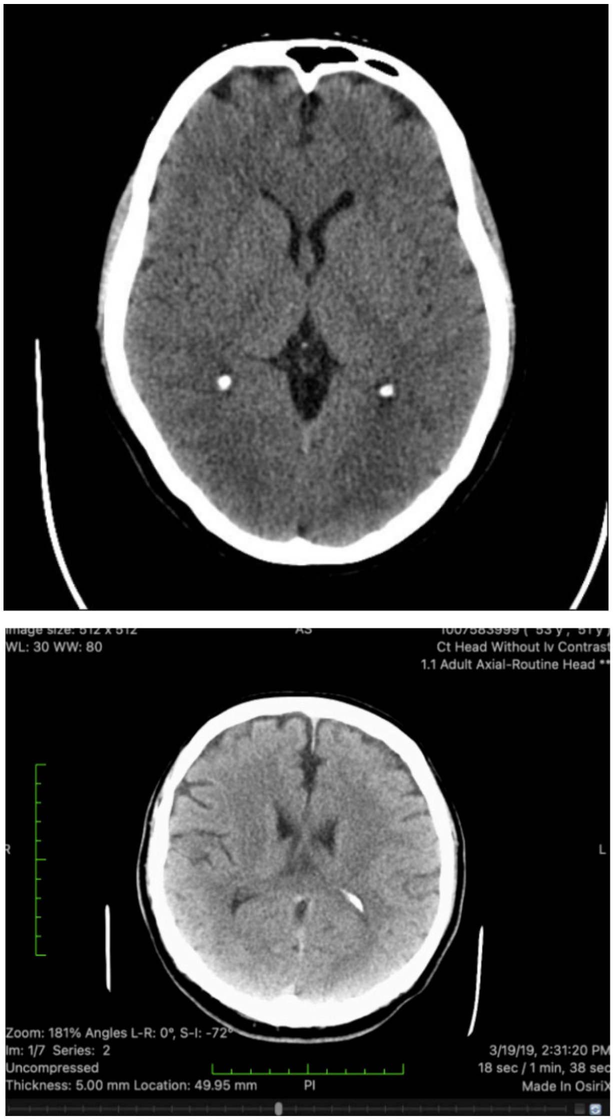
[19] Extra-axial = lesions that are external to the functional brain tissue

[20] Hydrocephalus = buildup of fluid in ventricles within the brain causing increases in the size of the head

[21] Herniation = something inside the skull produces pressure that moves brain tissues

However, there *was* mild prominence of ventricles, and the sulci reflected age-appropriate volume loss.

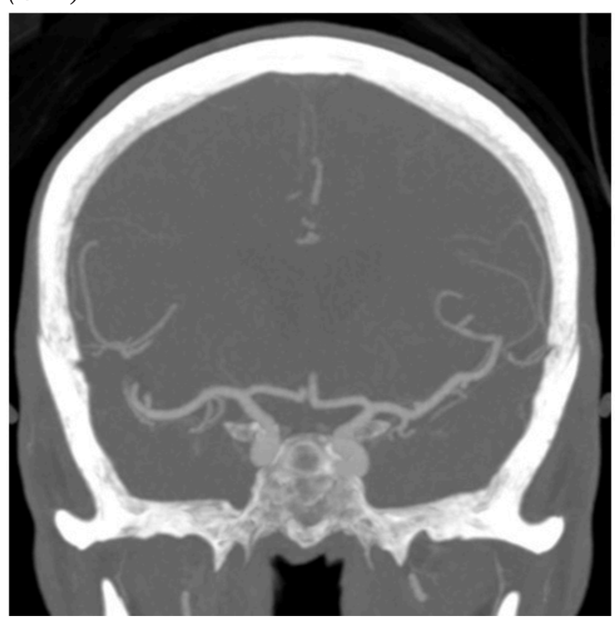
Figure 2: *Computerized Tomography (CT)*[22]



Note. The image on the top is an example of a normal CT scan. The image was borrowed from Hacking (2015). The image on the bottom is the patient's CT scan showing mild prominence of ventricles as well as age-appropriate sulci's volume loss.

The CTA showed no hemodynamically[23] significant stenosis[24] or aneurysm (Figure 3). The bilateral common carotid, right internal carotid artery, and vertebral arteries were patent without hemodynamically significant stenosis. However, there *were* calcifications/tonsillitis of the palatine tonsils, as well as multilevel discogenic[25] degenerative changes of the cervical spine, most pronounced at C4-C5 and C5-C6, where there is likely mild canal and mild-to-moderate bilateral neural foraminal stenosis. Additionally, there *were* mild calcifications along the aortic arch, and the origins of the vertebral and common carotid arteries were patent. There was a fibrofatty plaque at the carotid bulbs bilaterally,[26] with severe luminal narrowing of the left cervical internal carotid artery. The narrowing had a diameter of approximately 1.2 mm, beginning about 1.5 cm from the bifurcation[27] to the skull base.

Figure 3: *Computerized Tomography Angiography (CTA)*[28]



[22] See Appendix A for more details

[23] Hemodynamically = relating to the mechanics of blood circulation

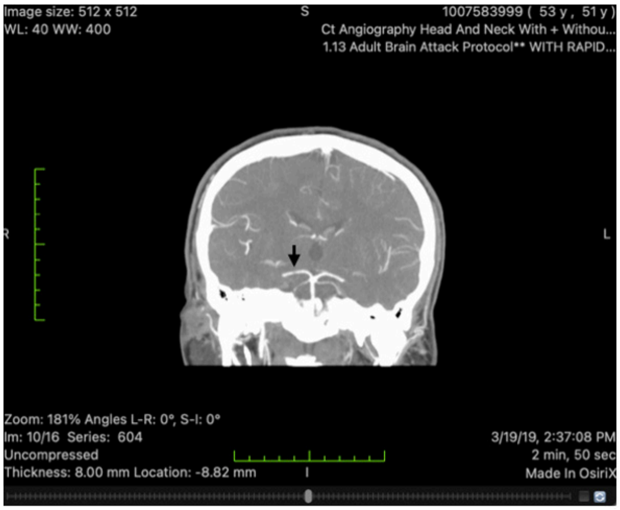
[24] Stenosis = narrowing

[25] Discogenic = degenerative changes such as structural defects that result in instability/inflammation between the vertebral bodies

[26] Bilaterally = both sides

[27] Bifurcation = the area where something divides into two branches

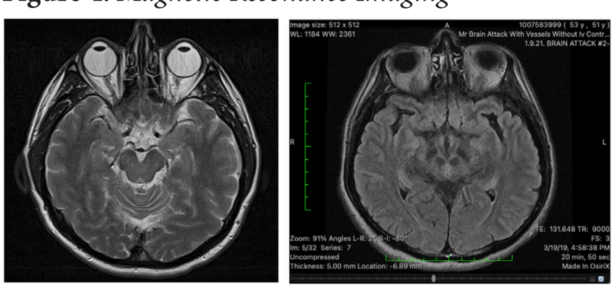
[28] See Appendix A for more details



Note. The first image (on the previous page) is an example of a normal CTA scan. The image was borrowed from Cuete (n.d.). The second image is the patient's CTA scan. The arrow in the image points to a minimal luminal narrowing with a string-like appearance of approximately 1.2 mm in the left internal carotid artery beginning about 1.5 cm from the bifurcation to the skull base.

The MRI showed no acute infarction, intracranial hemorrhage, mass effect, herniation, or extra-axial collection (Figure 4). There was, however, prominence of the ventricles and sulci that was consistent with minimal diffuse parenchymal volume loss. A few punctate foci of T2 hyperintensity in the periventricular and subcortical[29] white matter likely represents minimal chronic microvascular ischemic change. T1, T2, and fat-suppressed T2 FLAIR imaging of the distal cervical left internal carotid artery demonstrate findings consistent with arterial dissection with subintimal hematoma.

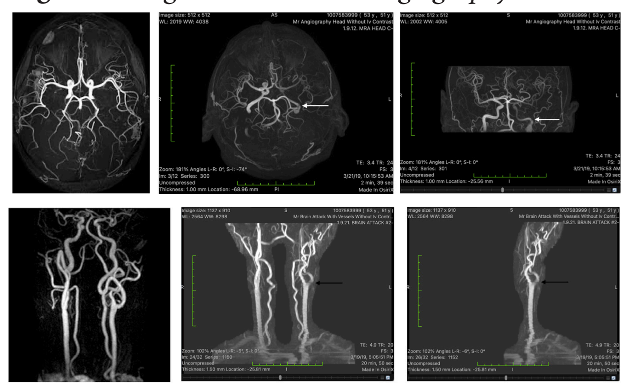
Figure 4: *Magnetic Resonance Imaging*[30]



Note. The image on the left is an example of a normal MRI. The image was borrowed from Hazell & Ainali (2023). The image on the right is the patient's MRI scan.

The MRA reflects that there is long segment severe stenosis of the cervical portion of the left internal carotid artery with T1 hyperintensity in the false lumen consistent with subintimal hematoma and a diagnosis of arterial dissection with severe luminal stenosis (Figure 5). There was a diminishment of flow-related signal in the petrous and hollow portions of the left internal carotid artery, suggesting a component of collateral flow from the circle of willis[31] with some retrograde flow into the cavernous left internal carotid artery. There is a slightly diminished flow-related signal in the left middle cerebral artery and its proximal branches but no focal significant stenosis or occlusion.[32]

Figure 5: *Magnetic Resonance Angiography*[33]



Note. The top row is an MRA of the head. The image on the left is an example of a normal MRA of the head. The image was borrowed from *Magnetic Resonance Angiography (MRA) Is an MRI of the Blood Vessels* (n.d.). The two images on the right are the patient's MRA scan of the head. The bottom row is an MRA of the blood vessels. The image on the left is an example of a normal MRA of the blood vessels. The image was borrowed from Burtea (n.d.). The two images on the right are the patient's MRA scan of the blood vessels. The arrows in the images localize the long segment in the left internal carotid artery that has severe stenosis, confirming a diagnosis of an arterial dissection. It also localizes the diminishment of flow-related signal, suggesting collateral flow from the Circle of Willis with some retrograde flow into the cavernous left internal carotid artery.

The imaging techniques used suggest that the patient suffered from an ischemic stroke caused by an arterial dissection with a subintimal hematoma in the area of the carotid artery (carotid dissection).

29 Subcortical = nerve centers below the cerebral cortex
30 See Appendix A for more details

31 Circle of willis = ring of vessels connecting the anterior and posterior circulations of the brain
32 Occlusion = the blockage of a blood vessel
33 See Appendix A for more details

After the diagnosis was confirmed, a lipid profile was conducted to help determine how best to treat the patient during their stay at the hospital (Figure 6). The patient's results showed normal levels of total cholesterol,[34] triglycerides,[35] and HDL ratio.[36] However, they also showed elevated levels of low-density lipoprotein[37] (LDL)[38] and lowered levels of high-density lipoprotein[39] (HDL).[40] The lipid profile results suggest an elevated amount of harmful lipids, which helps to best establish a treatment plan for the patient. The patient had to be put on clopidogrel bisulfate and Atorvastatin to help monitor the high amount of LDL found in the lipid profile and help stop blood clots.

Figure 6: *Lipid Profile*[41]

Component	Your Value	Standard Range	Flag
Cholesterol Total Desirable: <200 mg/dL Borderline High: 200-239 mg/dL High: >=240 mg/dL	**176.0** mg/dL	*<=199.0 mg/dL*	
Triglyceride Normal: < 150 mg/dL Borderline High: 150-199 mg/dL High: 200-499 mg/dL Very High: >=500 mg/dL	**144** mg/dL	*<=149 mg/dL*	
HDL Cholesterol Low HDL Cholesterol (Major Risk Factor): < 40 mg/dL High HDL Cholesterol (Negative Risk Factor): >= 60 mg/dL	**36** mg/dL	*>=40 mg/dL*	L
LDL Cholesterol Desirable: < 100 mg/dL Above Optimal: 100-129 mg/dL Borderline High Risk: 130-159 mg/dL High Risk: 160-189 mg/dL Very High Risk: >= 190 mg/dL	**111** mg/dL	*<=99 mg/dL*	H
Chol HDL Ratio	**4.9**		

Note. The image above is the patient's lipid profile. All normal values are indicated under "standard range" for reference.

Overall, these findings were consistent with the symptoms, which reflected a weaker left side, mostly in the upper extremities, as well as loss of proximal vision in the left eye caused by the severe restriction of blood flow. The patient's clinical symptoms correlate with compromised perfusion in regions supplied by the left internal carotid artery. The left middle cerebral artery (MCA) supplies key areas involved in motor control of the face and upper extremities and Broca's area in the dominant hemisphere, which is essential for speech production. The diminished flow-related signal seen is consistent with the patient's speech difficulties and left-sided motor deficits. The patient had suffered from a hematoma in the internal carotid artery, which restricted blood flow entirely by way of movement and, therefore, caused a blood clot.

Carotid artery dissection often involves a sequence of events in which mechanical strain leads to a tear in the arterial wall, particularly in areas already weakened by atherosclerotic plaque accumulation. These cholesterol-rich plaques contribute to endothelial injury, initiating a cascade of inflammatory responses and promoting blood coagulation. In this case, the arterial dissection and resulting subintimal hematoma compromised blood flow, ultimately causing an ischemic stroke. The body's hemostatic response, while essential for stopping bleeding, exacerbated the situation by forming intravascular clots that occluded cerebral circulation.

Treatment

The patient was in the Intensive Care Unit (ICU) for 3 days, the entire period of hospitalization. There, the patient received comprehensive monitoring and therapeutic interventions. As part of the in-hospital therapy regimen, the patient underwent targeted speech therapy sessions aimed at addressing and ameliorating neurological deficits, particularly dysarthria resulting from the stroke. Additionally, the patient was being consistently monitored for his vital signs, including body temperature, pulse rate, respiration rate, and blood pressure. Furthermore, regular monitoring of blood glucose levels was conducted. Given the nature of the patient's condition, monitoring of neurological deterioration was prioritized, allowing for early detection of any

[34] The desirable amount is <200 mg/dL. The borderline high amount is 200-239 mg/dL. The high amount >=240 mg/dL.

[35] The normal value is <150 mg/dL. The borderline high amount is 150-199 mg/dL. The increased amount is 200-499 mg/dL. The very high amount is >=500 mg/dL.

[36] The desirable amount is 4.0. The Borderline is 5.0. High-risk is 6.0.

[37] Low-density lipoprotein = bad cholesterol that is a significant contributor to clogged arteries

[38] The desirable amount is between <100 mg/dL. The above optimal amount is 100-129 mg/dL. The Borderline High-Risk is between 130-159 mg/dL. The high risk is between 160 and 189 mg/dL. The Very High Risk is >=190 mg/dL

[39] High-density lipoprotein = good cholesterol that helps protect against heart disease

[40] The low HDL Cholesterol (major risk factor) value is <40 mg/dL. The high HDL (negative risk factor) amount is >=60 mg/dL.

[41] See Appendix A for more details

concerning changes in neurological function and facilitating prompt intervention as needed.

The patient received a variety of IV medications to address the patient's condition. One crucial component was using sodium chloride 0.9%, commonly known as normal saline.[42] The patient received a 5ml flush injection intravenously every eight hours to ensure adequate hydration and circulation. The adverse effects of normal saline include, but are not limited to, hypernatremia, fluid retention, high blood pressure, electrolyte abnormalities, and injection site reactions.

Additionally, the patient received Alteplase,[43] marketed under the brand name Activase. The adverse effects of this drug include but are not limited to nausea, vomiting, dizziness, mild fever, and allergic reactions (swelling, rash, hives). The patient received a 0.9 mg/kg dose (not to exceed 90 mg total dose), with 10% of the total dose administered as an initial intravenous bolus over 1 minute and the remainder infused over 60 minutes.

The last IV medication the patient received was Heparin,[44] a type of antithrombotic, to inhibit platelet aggregation and thrombosis. Its adverse effects include but are not limited to Heparin-induced thrombocytopenia, hematoma, hemorrhage,[45] erythema,[46] and anaphylaxis.[47] The patient's initial dosage was given an IV bolus of 60 units/kg (max: 4000 units). Then, it was given at a dosage of 12 units/kg/hr (max 1000 units/hr) as continuous IV infusion.

The patient was also prescribed a variety of tablet medications. The first, Clopidogrel Bisulfate,[48] is commonly known as Plavix. Clopidogrel has a similar use in the patient's medication regimen, essentially functioning to inhibit platelet aggregation and thrombosis. The dosage prescribed was 75 mg by mouth once daily, with the treatment plan involving a transition to platelet monotherapy in three weeks, as determined by the neurologist during the follow-up visit. Adverse effects associated with Clopidogrel Bisulfate include upper respiratory tract infection, angina, influenza syndrome, arthralgia, and depression.

Additionally, Atorvastatin,[49] under the brand name Lipitor, was included in the patient's medication regimen to regulate cholesterol homeostasis, reduce plaque progression, manage lipid levels, and reduce the risk of cardiovascular events. The prescribed dosage was an 80 mg tablet of Atorvastatin once daily, with continuous refills as recommended by the neurologist. Adverse effects associated with Atorvastatin include swelling of hands, ankles, or feet, insomnia, muscle cramps, trouble breathing, and pancreatitis.

These medications, administered in conjunction with other components of the treatment plan, exemplify the comprehensive approach to addressing the patient's condition by targeting different aspects of stroke pathology, including volume restoration, thrombus dissolution, and anticoagulation; the treatment regimen aimed to optimize patient outcomes while mitigating potential risks. All of the medications given play pivotal roles in managing the patient's condition and reducing the risk of recurrent cardiovascular events. With the administration of medications, there was close monitoring of vitals and adverse effects. Additionally, regular follow-up assessments were recommended to ensure the safety and efficacy of the treatment regimen. The treatment plan aims to optimize the patient's long-term cardiovascular health and reduce the likelihood of future complications by addressing the underlying pathophysiology and associated risk factors.

Outcome and Follow-Up

A stroke caused by a carotid artery dissection is rare and best managed by an interprofessional team that includes a neurologist, emergency department physician, radiologist, vascular surgeon, and an internist. The patient needs to be educated about blood pressure control, as the recurrence of dissection has been reported in up to 10% of cases and the patient already suffers from high blood pressure. This means that there is a 75% chance that the patient will suffer from another stroke caused by a carotid dissection.

Upon the patient's discharge from the hospital, arrangements were made for comprehensive

[42] See Appendix B for more details

[43] See Appendix B for more details

[44] See Appendix B for more details

[45] Hemorrhage = bleeding

[46] Erythema = skin redness

[47] Anaphylaxis = allergic reaction

[48] See Appendix B for more details.

[49] See Appendix B for more details.

follow-up visits to ensure ongoing monitoring and management of his condition. These visits were scheduled with an ophthalmic and general neurologist to provide specialized care tailored to the patient's needs. The follow-up examinations were designed to encompass various diagnostic assessments to evaluate multiple aspects of the patient's health status and treatment response. Diagnostic imaging of the optic nerve of the eye was ordered to assess for any structural abnormalities or changes indicative of optic nerve involvement related to the stroke.

In addition, specialized tests were conducted to evaluate the patient's response to antiplatelet therapy, including assessments of platelet resistance to medications such as Plavix (Clopidogrel) and aspirin. These tests were essential for gauging the efficacy of the prescribed medicines in preventing clot formation and minimizing the risk of recurrent vascular events.

Furthermore, a follow up lipid profile was ordered to assess the patient's lipid levels and cardiovascular risk factors, providing valuable information for optimizing lipid-lowering therapy and reducing the risk of future cardiovascular events. Non-invasive imaging studies were scheduled as well to assess the later vascular status of the head and neck, including M.R. angiography without IV contrast.

The patient's ongoing care was optimized by coordinating these follow-up visits and examinations with a multidisciplinary team of specialists, including ophthalmic and general neurologists, ensuring thorough evaluation and targeted intervention to promote recovery and minimize the risk of recurrent stroke.

Discussion

While the clinical findings align with common presentations of carotid artery dissection (including unilateral facial paralysis, dysarthria, and hemiparesis), this case is notable for the prolonged period between the initial injury and hospitalization, as well as the specific occupational trigger—a forceful neck strain while roofing.

As there is a limited amount of research done on the connection between work-related efforts and carotid dissection, the case of the patient, a roofer, underscores the critical need for a nuanced understanding of the early symptoms of strokes, particularly within the context of physically demanding and hazardous work conditions. Roofing, characterized by strenuous labor and exposure to challenging environments, represents a profession where the potential impact of a stroke can be profoundly magnified. This discussion aims to shed light on individuals' distinctive challenges in such occupations, emphasizing the importance of early symptom recognition to enhance clinical management and outcomes for those affected by carotid dissection.

Early symptoms of strokes often manifest subtly, making their identification challenging, especially in physically demanding work settings. In the case of the roofer, the initial signs, including pharyngitis and episodes of asphyxiation, were subtle and easily attributed to general illness. The later symptoms, such as left arm paresis and facial paralysis on the left side, seemed to be caused by the physical strain of the job, simply being attributed to physical exhaustion. The demanding nature of roofing may contribute to delayed recognition of neurological symptoms, as individuals may dismiss initial signs as consequences of their labor-intensive activities. This delay in identification poses a significant obstacle to timely medical intervention, which is crucial for mitigating the consequences of a stroke.

To improve clinical management and outcomes for individuals affected by carotid dissection in physically demanding professions, there is a need for heightened awareness and education. Occupational health programs should incorporate specific training on recognizing early symptoms of strokes, emphasizing the importance of seeking prompt medical attention.

A variety of changes can be implemented in order to minimize the risk of those in physically demanding jobs. These changes overall include improving the safety protocols and procedures. This can be done through providing comprehensive training on safe work practices and hazard recognition, as well as introducing equipment or techniques that reduce physical strain, such as mechanical lifts for heavy materials, ergonomic tools, or assistive devices to minimize manual lifting and carrying. Additionally, ensuring adequate rest and breaks can help to prevent fatigue and overexertion, both of which contribute to strokes. Workers should have sufficient time to rest and recover by either minimizing shift hours, allowing for more breaks, or allowing for flexible work arrangements with more time off, such as job rotations between workers. As such, regular health screenings and assessments should be mandated for workers, allowing for timely intervention and preventive measures. Finally, due to the excessive amount of physical strain, workers in physically demanding jobs should have an earlier retirement age to prevent illness caused by a combination of old age and physical strain. By implementing these changes, employers can create safer and healthier work environments that prioritize the well-being of workers and reduce the risk of injuries and health complications, specifically with an emphasis on strokes.

Advocacy for safer working conditions is paramount and requires the collaboration of healthcare professionals, employers, and regular civilians. Through collaborative efforts, we can pave the way for safer working conditions and enhanced well-being for those at risk in physically demanding professions.

Appendix A (Diagnostic Tools)

This appendix aims to provide more in-depth information on the diagnostic tools used in the evaluation and diagnosis of this carotid artery dissection.

Chest X-Ray

A chest x-ray utilizes a projection radiograph to diagnose conditions that affect the chest/thoracic cavity. It displays nearby structures and the details of the internal chest. This is done with a small amount of radiation and computed tomography that produces images of the heart, blood vessels, airways, lungs, and the bones in the chest and spine area. A sizable movable x-ray machine is attached to a large metal arm. The movable x-ray is moved to various angles to capture pictures from different perspectives. The patient should take a deep breath and hold it for several seconds. This will help the patient's heart and lungs appear more clearly in the image. On a healthy chest x-ray, we see a large amount of the image is radiolucent,[50] showing air in the lungs. Structures that block radiation appear radiopaque.[51] In an abnormal x-ray, there will be fluid in or around the lungs, heart, or air surrounding a lung.

[50] Radiolucent = dark

[51] Radiopaque = light

Computerized Tomography (CT)

A CT scan uses x-rays to create an image of an area in the body using a series of pictures from different angles. Together, these various images create a cross-sectional image of an area or structure within the body. CT scans are often used in acute neurological emergencies and trauma cases because they are quick to administer. During a CT scan, the patient lies in a tunnel-like machine while the inside rotates, taking a series of images from various angles. These constructed images are then sent to a computer. There, the images are combined to create detailed cross-sectional images of different areas/structures. They may also be connected to produce a 3-D image of a particular body area.

Computerized Tomography Angiography (CTA)

A CTA looks explicitly at the vessels of the brain to detect any abnormalities or blockages. Like a CT scan, a CTA uses a computer to take images via x-ray; however, for a CTA, vascular access must be established to inject an IV contrast. This is done to provide a clearer image of the arteries.

Magnetic Resonance Imaging (MRI)

Magnetic Resonance Imaging (MRI) produces high-resolution images of organs and other structures in the body using radio waves and magnets. It is a form of medical imaging that uses nuclear magnetic resonance. This means that it takes images of the nuclei of atoms within the body. In an MRI, radio waves are reflected by fat and water within the body. These reflections are then collected and recorded by a computer. The MRI machine translates the collected data into a detailed image that is then used to assess the area being examined.

Magnetic Resonance Angiography (MRA)

Like an MRI, an MRA uses nuclear magnetic resonance. However, an MRA specifically uses hydrogen-created radiofrequency signals that travel through the arteries to create images. Then, a computer removes images of other structures, making the image of the arteries clearer. Like a CTA, vascular access must be established to inject an IV contrast. The laser beam localized is centered over the glabella.

Lipid Profile

A lipid profile measures the amount of fatty substances found in the body's cells through the collection of blood. It is done through the collection of blood through a 21-gauge needle connected to an SST tube (also known as a plasma separator tube). After collection, the plasma is separated from the cells by being centrifuged for a minimum of 10 minutes and then the sample is refrigerated until it will be analyzed. A lipid profile provides the physician with the total cholesterol, triglyceride, HDL, LDL, and cholesterol ratio values.

Appendix B (Medications)

This appendix aims to provide more in-depth information on the medications used to treat this carotid artery dissection.

Sodium Chloride 0.9%

Sodium Chloride 0.9%, also known as normal saline, is an aqueous solution of electrolytes[52] and other hydrophilic[53] molecules. Normal saline functions to expand intravascular volume without disturbing ion concentration.

Alteplase

Alteplase, also known as Activase, is a tissue clot buster. Thrombolytic drugs such as clot busters are given to patients who are having an ischemic stroke. It can stop a stroke by breaking up the clot. It must be given within 4.5 hours after stroke symptoms start, and receiving it can reduce the severity of a stroke and reverse some of the effects, ensuring a speedy recovery.

Heparin

Heparin is an anticoagulant/thrombolytic agent that is injectable. It stops the formation of blood clots by blocking the action of clot-promoting proteins in the blood.

Clopidogrel Bisulfate

Clopidogrel Bisulfate is an antiplatelet drug that inhibits the ability of platelets to clump together. "Drugs that inhibit platelet function have been shown to decrease morbid events in people with established cardiovascular atherosclerotic disease" (*Plogryl Product Clinical Pharmacology*, n.d.)

Atorvastatin

Atorvastatin is an HMG-CoA reductase inhibitor, also known as a statin, meaning that it works to lower cholesterol. As such, it is used together with "diet, weight loss, and exercise to reduce the risk of heart attack and stroke" (*Adivast [Atorvastatin Calcium]*, n.d.) to decrease the amount of fatty substances and triglycerides in the blood and increases the amount of good cholesterol (*Lipicure -Why Is This Medication Prescribed?*, n.d.). This is because accumulation of cholesterol and fats along the walls of the arteries (atherosclerosis) decreases blood flow. With this in mind, atorvastatin works to slow the production of cholesterol in the body that may build up on the walls of the arteries and block blood flow. "Lowering… blood level of cholesterol and fats with Atorvastatin has been shown to prevent heart disease, angina (chest pain), strokes, and heart attacks" (*Lipicure - Why Is This Medication Prescribed?*, n.d.).

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Together, the collective efforts of these individuals have culminated in the completion of this case study, which I hope will contribute to the broader body of knowledge surrounding carotid artery dissection

[52] Electrolytes = ions that dissociate in solution

[53] Hydrophilic = strong affinity for water

and, ultimately, improve the lives of those affected by this condition.

Author's Disclosure

This case report is based on the firsthand clinical experience of my father, who provided informed consent for the sharing of his medical history, imaging, and treatment details. The case was documented using personal interviews and access to the patient's hospital records, obtained with full permission and in accordance with ethical research practices. This case reflects a real and medically verified diagnosis of carotid artery dissection. The intent is to offer a patient-centered perspective on stroke diagnosis and treatment, with the goal of highlighting occupational risk factors and improving awareness of early symptom recognition in physically demanding professions.

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