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Management of aortic occlusion in a morbidly obese smoker: A case report

Timothy N Le, David A Roberts, Ali Kimyaghalam and Kuldeep Singh

Abstract

Total occlusion of the abdominal aorta is a rare and life-threatening event. Risk factors most commonly include coagulopathy, vasculitis, trauma, abdominal aortic aneurysms, aortic thromboembolism, and aortic dissection. The most common complications include severe ischemic manifestations in the lower extremities, spinal cord, or viscera. Thus, management is largely dependent on presumed etiology. We present a case of a morbidly obese 52-year-old female with a past medical history of hypertension, diabetes mellitus, peripheral vascular disease, and coronary artery disease with a smoking history of three packs per day for over 10 years. The patient first presented to our emergency department with bilateral lower extremity paresthesia and pain at rest. Further evaluation through computed tomography angiogram thus revealed infrarenal occlusion of the abdominal aorta and bilateral common iliac arteries; the patient was treated with an aorto-femoral bypass without further sequelae. Our case report details the associated risk factors of acute on chronic aortic occlusion and its management.

Keywords

Subacute aortic occlusion, abdominal aorta, atherosclerosis, aortic thrombosis

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Introduction

Total occlusion of the abdominal aorta can present as an acute event or with chronic symptoms. Acute aortic occlusion is a rare and life-threatening event with mortality ranging as high as 20%–50% while these values are not well established for chronic disease.[1] Advanced peripheral artery disease typically presents with the classic "Five P's" of pain, pallor, pulselessness, paralysis, and paresthesia.[2] The level at which the arterial occlusion occurs thus manifests with signs of ischemia distal to the site of occlusion: possibly affecting extremities, spinal cord, intestines, and/or kidneys.[3] Notable symptoms include claudication and rest pain, although unusual presentations such as paraplegia have also been described as a result of aortic occlusion around the level of the artery of Adamkiewicz.[2] It is thus important to recognize general ischemic signs to allow for prompt and appropriate intervention. Risk factors for acute aortic occlusion commonly include coagulopathy, vasculitis, trauma, abdominal aortic aneurysms, aortic thromboembolism, and aortic dissections.[4] Risk factors for chronic aortic occlusion include advanced atherosclerotic peripheral vascular disease.[5] Our report details a case of acute on chronic aortic occlusion in a morbidly obese patient with a strong smoking habit managed with open revascularization.

Case report

The patient was a morbidly obese 52-year-old female with a past medical history of hypertension, diabetes mellitus, peripheral vascular disease, and coronary artery disease with a smoking history of three packs per day for over 10 years. She was 5′3″, 210 lbs, and had a body mass index (BMI) of 37.2 kg/m^2. She first presented to a different hospital's emergency department with chest pain in addition to intermittent claudication. Electrocardiogram (EKG) and cardiac work-up at that time showed unstable angina requiring percutaneous coronary intervention. Femoral artery catheterization was

Vascular Surgery, Staten Island University Hospital, Staten Island, NY, USA

Corresponding Author:
Timothy N Le, Vascular Surgery, Staten Island University Hospital, 475 Seaview Avenue, Staten Island, NY 10305, USA.
Email: Le.timothynguyen@gmail.com

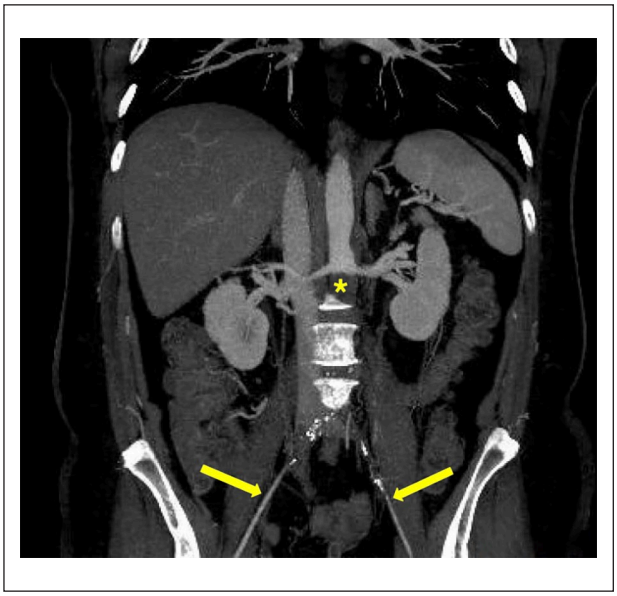

Figure 1. Coronal view of the CT angiogram revealing infrarenal aortic occlusion (*) with reconstitution of the external iliac arteries (arrows). Bilateral renal arteries were free of thrombus with normal opacification of the kidneys.

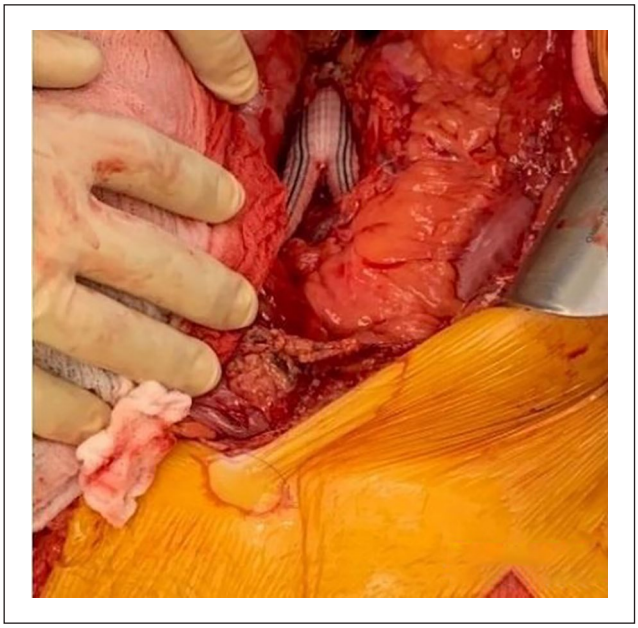

Figure 2. Open aorto-bifemoral bypass using a Terumo gelsoft plus bifurcated graft.

attempted and unsuccessful, so radial artery catheterization had to be performed. After the coronary stent was placed her chest, pain resolved but she continued to have lower extremity rest pain. Computed tomography (CT) performed at that time showed infrarenal occlusion of the aorta with positive collateral flow. She was told to follow-up with her vascular surgeon but was lost to follow-up. One month following her hospital admission, the patient presented to our emergency department for the first time with acutely worsening symptoms of bilateral lower extremity paresthesia and pain at rest. The patient had weak posterior tibial and dorsalis pedis pulses as well as monophasic signals bilaterally on doppler exam. She had intact lower extremity motor function, and appropriate skin color. Further evaluation through computed tomography angiogram at that time revealed infrarenal occlusion of the abdominal aorta and bilateral common iliac arteries with reconstitution of the external iliac arteries (Figure 1). Additional work-up was performed to rule out causes of limb ischemia. EKG showed no signs of acute cardiac ischemia or infarction. Echocardiogram showed normal ejection fraction and no cardiac wall abnormalities. Coagulation studies including D-dimer testing, COVID testing, antiphospholipid antibody syndrome enzyme studies, and Factor 5 Leiden deficiency were all negative. Troponins were not elevated, and neither myoglobin nor creatinine kinase levels were assessed. Renal function testing showed a creatinine level increased to 1.4 from 1.1 at baseline.

Intraoperatively, proximal control of the aorta was obtained using a supra-renal cross clamp with control of the renal arteries to prevent renal artery embolization. The common femoral arteries were found to be soft and were cross clamped for distal control. Following control, the proximal aorta was transected inferior to the renal arteries as indicated by our CTa showing total infrarenal aortic occlusion. At the level of transaction, there was dense atherosclerosis with overlying organized thrombus formation. Interestingly, there were no gross signs of ruptured plaque or transmural inflammation identified. An aorto-femoral bypass with a bifurcated 28 mm Terumo (Ann Arbor, MI) Gelsoft plus graft was promptly performed in the traditional fashion (Figure 2). Postoperatively, the patient experienced immediate resolution of her lower extremity symptoms.

Discussion

A thrombus is the formation of a blood clot that can present in both the arterial and venous systems.[6] Virchow's triad of hypercoagulability, blood stasis, and endothelial injury is the classic explanation for thrombus formation.[6] Moreover, thrombus formation in the arterial system can also occur from rupture of an atherosclerotic plaque, aneurysms, or dissections.[4,6] If large enough, thrombus can cause occlusion of distal vascular beds.[3]

The incidence of an acute aortic occlusion is extremely rare. A Nationwide Cohort study identified only 715 cases of acute aortic occlusion over the course of 1994–2014, equivalent to 3.8 per 1-million-person years.[7] The vast majority are caused by in situ thrombosis (64.1%) followed by saddle embolus (21.3%) and occluded grafts/stents (14.7%).[7] Comorbidities such as hypertension, hyperlipidemia, diabetes mellitus, and smoking history place patients at higher risk for aortic occlusion.[3,8,9] In addition, numerous non-modifiable risk factors such as age, gender, family

history of atherosclerotic disease, and genetic thrombophilia can also significantly increase a patient's risk.[4,9]

In contrast to acute aortic occlusion, chronic aortic occlusion is less well understood on an epidemiological level. It is estimated from an autopsy study performed in 1958 that the prevalence of total infrarenal aortic occlusive disease is 0.15%.[10] Further studies showed that of the patients who presented with aortoiliac occlusive disease, only 3%–8.5% have total aortic occlusion.[11–13] Reconstructive treatment for chronic aortic occlusion such as aortobifemoral bypass is the most standardized intervention for these patients, which has perioperative patency rates of 91.4%.[14] However, endovascular treatment for highly occlusive atherosclerotic disease affecting the aorta and iliac arteries has quickly become a popularized approach. Indications for surgical treatment in chronic aortic occlusion include disabling intermittent claudication (65.6%), ischemic rest pain and/or pregangrene (20.7%), and ischemic gangrene (13.7%).[14] Despite standardized treatment approaches for chronic aortic occlusive disease and strong epidemiological evidence supporting acute aortic occlusion as an independent disease, there is limited understanding of the epidemiology and pathophysiology of subacute or acute on chronic total aortic occlusion. Our case is meant to serve as an example of such a diagnosis. Future studies are needed to explore the differences between these varieties of total aortic occlusion.

In our patient, a full work-up including cardiac echogram and testing for hypercoagulation did not reveal any potential sources for occlusion. Examination of her aorta also showed no significant atherosclerotic plaque. In addition, she denied any history of aortic or cardiac interventions that could have potentially caused a dissection or rupture of a plaque. We presumed the patient's history was most significant for smoking and morbid obesity which likely led to her presentation. Obesity and smoking are known risk factors for thrombotic states and have been associated with aortic pathogenesis.[15–18] One study concluded that obese patients had higher levels of procoagulant particles and increased thrombin generation which lead to hypercoagulability.[2] In addition, obese patients are even more hypercoagulable after injury or trauma.[15] Smoking is a well-known risk factor for small vessel disease and studies have shown that smoking drastically affects aortic integrity due to increased levels of proteases, chronic inflammatory infiltration, and dysfunction to aortic matrix repair.[17] That combined with smoking's propensity for oxidative damage, increased smooth muscle cell proliferation, and increased platelet aggregation promote occlusive disease.[18]

Aortic occlusion is a significant finding and calls for emergent surgical intervention. It is important for clinicians to keep such differentials in mind when patients present with signs of lower extremity hypoperfusion. Once occlusion is suspected, computed tomography angiogram is the recommended imaging modality and can provide the exact location and extent of the disease.[4] An acute worsening in ischemic symptoms in a patient with previously documented aortic occlusion, as was seen with our patient, should prompt immediate work-up and treatment. Recommended management is largely dependent on presumed etiology and consists mainly of aorto-femoral bypass, transfemoral versus transaortic thrombo-embolectomy, or direct aortic reconstruction.[4] Endovascular management with techniques such as catheter-directed thrombolysis, aspiration/mechanical thrombectomy, or endovascular stenting have also been described, but with limited use since the thrombus may be solidified and difficult to extract and with a significant risk of embolization.[1] However, there are some advantages to endovascular intervention due to preservation of hemodynamic stability and avoidance of aortic cross-clamping.[1] Endovascular intervention may thus be an option in high-risk patients especially if the thrombus is acute.

Conclusion

Our case highlights a presentation of acute on chronic aortic occlusion discovered in a morbidly obese patient with a strong smoking history without previous interventions. A literature search revealed studies documenting associations between aortic thrombus in smokers and in obese patients, however studies describing complete occlusion of the aorta in such patients were limited. Our report hopes to demonstrate that patients with established risk factors and hypercoagulable states for aortic thrombus should have such diagnosis included in possible differentials when presenting with signs of lower extremity hypoperfusion.

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Author contributions

T.N.L, MD, contributed to study design, interpretation of results, manuscript drafting, and critical review. David A. Roberts MS: manuscript drafting, interpretation of results, and critical review. A.K., MD, contributed to interpretation of results, manuscript drafting, and critical review. K.S., MD, contributed to study design, interpretation of results, manuscript drafting, and critical review.

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Ethical approval

Our institution does not require ethical approval for reporting individual cases or case series.

Informed consent

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ORCID iD

Timothy N Le https://orcid.org/0000-0002-9132-8794

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