Concomitant elective resection of pheochromocytoma and repair of aortic abdominal aneurysm

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DECLARATIONS

Competing interests

None

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors

Ethical approval

None

Guarantor

None

Contributorship

All the authors contributed equally

Acknowledgements

All contributing authors are listed

Abstract

Perioperative management of a patient with ischemic heart disease with coexisting abdominal aortic aneurysm and pheochromocytoma creates a difficult management dilemma, and surgical intervention in these patients carries a significant risk. The state of catecholamine excess and various other coexisting factors can lead to simultaneous occurrence of abdominal aortic aneurysm and pheocromocytoma. The purpose of this report is to present an integrated approach to the management of concomitant abdominal aortic aneurysm and pheochromocytoma, where a combined surgical approach in addressing these two lesions was preferable due to patient comorbidities and surgical implications without significant complication.

Key words: Acute myocardial infarction, etiology, cardiology, hypertension, diagnostic testing, abdominal aortic aneurysm, pheocromocytoma

Case report

The patient is a 65-year-old male who came to the attention of the anesthesia service after being assessed by his primary care physician for hematuria. The patient's medical history included: hypertension, hyperlipidemia, and myocardial infarction. In 1992, the patient underwent PTCA with stent placement. Work-up revealed elevated urinary metanephrines consistent with a diagnosis of pheochromocytoma, and CT scans showed a large right adrenal septated cystic mass that contained foci of fat and calcifications separate from the right kidney, as well as an infrarenal aneurysm. The aneurysm measured 5.4 cm × 4.9 cm. It extended down to include the left common iliac artery, measuring 2 cm in diameter.

A decision was made to operate on the patient with a planned concomitant resection of the adrenal mass and repair of the abdominal aortic aneurysm (AAA) due to the patient bilateral occlusive iliac disease and involvement of the left common ileac artery by the aneurysm. Also three-dimensional reconstruction CT scan shows unsuitability for endovascular repair of aortic aneurysm (EVAR) due to aneurysm morphology.

The patient was continually managed by the endocrinology service for optimization of his hemodynamic status prior to surgical intervention. During the preoperative work-up, the patient demonstrated noncritical disease of left anterior descending and right coronary artery by cardiac catheterization. The Persantine myocardial study showed mild to moderate ischemia of the inferolateral wall with reduced left ventricular ejection fraction (45%).

As the patient was asymptomatic at this time, he was deemed fit to proceed to surgery with

adequate beta blockade and optimization of his hemodynamic status. The patient was managed for approximately four months by the endocrinology team, who optimized his blood pressure with antihypertensive agents including phenoxybenzamine, isosorbide, and atenolol. The major goals in the anesthetic management of patients with pheochromocytoma and aortic aneurysm are maintenance of cardiovascular stability, and avoidance of tachycardia and hypertensive crisis.[1] Our patient, perioperative, was hemodynamically optimized with alpha-1 and beta blockers preoperatively. We verified this clinically on the day of surgery by confirming orthostasis. Anticholinergic agents and sympathomimetic neuromuscular blocking agents were avoided. Depth of anesthesia was monitored with the use of a bispectral index monitor. Hemodynamic parameters remained stable throughout the induction of general anesthesia. A two-dimensional transesophageal echocardiography (TEE) was placed for monitoring of the cardiac function and evaluation of the extent and severity of the aortic pathology. Two-dimensional echocardiography is a sensitive and specific technique for detecting transient myocardial ischemia, and TEE monitoring is widely used to evaluate myocardial ischemia during cardiac surgery.[2] However, data for the use of TEE during non-cardiac surgery are controversial if the patient is hemodynamically stable.[3] Given the association of pheochromocytoma with AAA in a patient with ischemic heart disease, and its resultant poor prognoses, early diagnosis and early treatment of myocardial ischemia are critical. TEE provides important real-time information on cardiac filling and function, and is particularly useful when unexplained hemodynamic instability is encountered.

The initial phase of the procedure was the right adrenalectomy, which was achieved with minimal hemodynamic instability during manipulation of the tumor. The AAA repair proceeded after completion of adrenalectomy. Through the same incision the duodenum was mobilized off of the aneurysm over to the right side of the abdomen. The neck of the aneurysm was exposed and was continued distally to expose both iliac arteries. Heparin 6000 units were administered intravenously before attaining proximal and distal control. At aortic cross-clamping, the blood pressure swings were minimized by supplemental boluses of vasoactive drugs. The aorta was opened longitudinally with removal of large amounts of thrombus. A 16 mm graft was used in the repair. Prior to the time of release of the cross-clamp, the patient was loaded with 2 L of crystalloid fluid, and immediately after release of the cross-clamp, we noted hypotension, with empty cardiac chambers by TEE. Further fluids and pressers were administered, with good response. The patient continued to require low-dose norepinephrine, despite adequate volume resuscitation. This low-tone state was probably a combination of reduction in endogenous catecholamine levels post-adrenalectomy, residual alpha-blockade, and a systemic inflammatory state due to the stress of surgery. The remainder of the case proceeded uneventfully, and the patient was transferred to the ICU stable. Postoperative recovery was uneventful. Twelve months following surgery, the patient remained totally asymptomatic, normotensive, and on no antihypertensive medication.

Discussion

The most frequent etiology of aortic rupture is aneurysm.[4] Risk of rupture of an aortic aneurysm increases with increased diameter of the aorta. Currently, a diameter more than 55 mm is an indication for treatment with surgical or endovascular means; our patient's aneurysm was 54 mm.[4,5] Other potential causes include trauma, and plaque rupture.

The introduction of EVAR has presented a unique treatment option to approximately half of the patients presenting for AAA repair. The immediate benefits of reducing early morbidity, blood loss, length of stay, and recovery have been proven.

Anatomic factors that influence suitability for EVAR include adequacy of vascular access for device introduction; aneurysm morphology; neck length and morphology; and iliac artery involvement.[4,5] Our patient did not meet criteria for EVAR due to excessive calcified iliac arteries and morphology of the aneurysm.

Characteristically, patients with pheochromocytoma with sustained or paradoxical hypertension and the triad of headaches, palpitations, and sweating are often seen.[6] There are several published reports for unusual presentations of benign

or metastatic pheochromocytoma; for this reason, pheochromocytoma is sometimes labeled ''the great mimic''. Our patient presented hematuria, and work-up revealed a mass in the right adrenal gland and elevated metanephrines.

There are other previously reported cases of pheochromocytoma coexisting with aneurysms. In 1999, Ehata et al.[7] reported a case of ruptured AAA repair in which a pheochromocytoma was diagnosed postoperatively by CT scan. In 1989, Thompson et al.[8] also reported a case in which a pheochromocytoma was found using methyliodobezylguanidine imaging after a repaired AAA began leaking. We report a second case in which a pheochromocytoma was resected concomitantly with AAA repair in an elective setting; the only other documented case that we were able to find was in 2006, Spanos et al.[9]

The coexistence of pheochromocytoma and AAA poses certain problems, and surgical intervention in these patients carries a significant risk of myocardial infarction, cerebrovascular accident, and cardiovascular collapse. In the preoperative period, there is an increased risk of rupture of the aneurysm, caused by excess catecholamine and hypertension.[10] For this reason, treatment and control of the patients' elevated blood pressure should be achieved as soon as possible. A combined approach in addressing these two lesions is preferable so that the patient needs to undergo anesthesia only once. Associated pulmonary complications that often develop in patients with AAA are also well documented.[11]

The administration of heparin (100 IU/kg) before cross-clamping has been shown to reduce thrombotic and embolic events. Risks associated with the combined approach of pheochromocytoma resection with abdominal aneurysm repair with heparinization include tumor hemorrhage with excessive retroperitoneal bleeding. To ameliorate any serious intraoperative complication, an alternative approach to overcome this is to perform resection of the pheochromocytoma first. That way we could deal with minor retroperitoneal bleeding points before heparinization, and remove excess sources of catecholamine, allowing repair of the AAA in a more stable hemodynamic setting. If the tumor resection is undertaken in isolation and without AAA repair, then the potential risk is perioperative myocardial infarction in a patient with coexisting coronary artery disease. Also, resecting the pheochromocytoma places the aneurysm at an increased risk of rupture in the postoperative period.

Management of an aortic aneurysm always includes strict blood pressure stabilization, but in the presence of a catecholamine-secreting pheochromocytoma, control can be difficult. Moreover, surgical manipulation of a pheochromocytoma may trigger an intractable hypertensive crisis and leads to aortic disruption.[6] Aneurysm rupture during hypertensive crisis is a serious complication which is difficult to manage.

Conclusion

The presence of abdominal aortic aneurism and pheochromocytoma presents unique and clinically challenging anesthetic goals. Both lesions present life-threatening situations. Specific therapeutic modalities have to be coordinated. TEE provides invaluable perioperative diagnostic and monitoring guidance. This article reviews the perioperative implications of a concomitant AAA and pheochromocytoma, and integrates an approach to the management that facilitated safe adrenalectomy and aortic aneurysm repair.

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