

Repair of thoracoabdominal aortic aneurysms using aorto-femoral shunt.

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Thoracoabdominal aortic aneurysm is not common. Surgical resection requires exposure of both chest and abdomen. The most disturbing complications are bleeding, paraplegia, and renal failure. The use of low-dose systemic heparinization, aorto-femoral shunt, using home-made canulae and tubes, and zero-porosity vascular graft makes this extensive operation relatively safe. We report two cases of thoracoabdominal aortic aneurysm treated successfully .

Key words : *Thoracoabdominal aortic aneurysm, Repair, Aorto femoral shunt.*

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หลอดเลือดแดงใหญ่ที่ช่องอกและช่องท้องโป่งพองพบได้ไม่บ่อย การทำผ่าตัดต้องเปิดเข้าทั้งทาง
ช่องอกและช่องท้อง ผลแทรกซ้อนที่น่าสะพรึงกลัวได้แก่ ภาวะเสียโลหิตมากอัมพาตของขาสองข้าง และ
ไตวาย การให้เฮปารินทางหลอดเลือดดำร่วมกับการใช้ทางลัดระหว่างเอออร์ตากับหลอดเลือดแดงที่ขา
โดยใช้ท่อที่ประกอบขึ้นเอง การใช้หลอดเลือดเทียมที่ไม่มีรูให้เลือดผ่านช่วยให้การผ่าตัดที่มากมายนี้
ปลอดภัยมากขึ้น เสนอนรายงานผู้ป่วยสองรายที่ได้รับการผ่าตัด โดยไม่มีผลแทรกซ้อนที่รุนแรง และรอด
ชีวิตทั้งสองราย

Thoracoabdominal aortic aneurysm is defined as an aneurysm involving the descending thoracic aorta and the abdominal aorta. From this part of the aorta, several important visceral branches arise as intercostal arteries supplying the spinal cord via the artery of Adamkiwicz, the celiac axis, SMA and IMA supplying abdominal viscera, renal arteries, and arteries supplying both lower extremities. This type of aneurysm is relatively virulent because the rupture rate is high. Crawford and DeNatale⁽¹⁾ followed 94 patients who did not undergo thoracoabdominal aortic aneurysm repair because of associated disease, advanced age, small size of the aneurysm, or patient refusal. By Kaplan-Meier analysis, only 24 % of the patients were 2-year survivors and half of the deaths were due to rupture. The most common cause of TAAA is atherosclerosis. Associated diseases are common. Usually patients with this type of aneurysm are males in their 6th or 7th decade of life. Coronary artery disease is relatively common among patients in this age group. Repair of this type of aneurysm requires thoracoabdominal incision. Dissection is extensive in the posterior mediastinum and retroperitoneum. Cross-clamping of the thoracic aorta causes ischemia of abdominal viscera, the lower limb as well as spinal cord. Resection of the aneurysm also necessitates reimplantation of visceral arteries, so the ischemic time to all viscera is relative prolonged. Thus, the repair of a thoracoabdominal aortic aneurysm is a difficult and risky operation. We report the technique we use to overcome these difficulties.

Case reports

Case 1

An 81-year-old woman came to the hospital because of palpable epigastric mass of about six months duration. Prior to her visit, she had recently experience back pain and felt that the mass was enlarging. Her past history revealed inferior wall myocardial infarction 10 years previously. Physical examination revealed blood pressure of 140/80 mmHg. All peripheral pulses were strong and equal. The epigastric mass was pulsatile and its diameter was 10 cm. Laboratory tests were within normal limits except for BUN Cr = 30/1.6 mg %. CT scan showed a thoracoabdominal aneurysm from the level of the lower descending thoracic aorta to the level of the renal arteries. An aortogram revealed TAAA with stenosis of the ostia of the left renal arteries. An operation was performed with the thoracoabdominal incision being made through the 7th intercostal space. The diaphragm was divided radially. The left retroperitoneal space was entered with the abdominal viscera and left kidney being retracted medially. Systemic heparin (1 mg per /kg) was given intravenously. A shunt made from canula and tubes that we use in open heart

surgery was inserted into the proximal descending aorta and left femoral artery. The aorta was cross-clamped just proximal to the aneurysm; another clamp was inserted just distally. The aorta was completely transected, and then it was anastomosed to a 24-mm gelatin coted knitted Dacron graft. While doing the proximal anastomosis, the abdominal viscera were perfused through the shunt. Then another clamp was placed just below the renal arteries. The aneurysm was opened with cautery. Back bleeding from the lower intercostal arteries, renal artery, celiac axis and SMA were controlled with Fogarty catheter. An opening was made in the graft and sutured around the ostia of the intercostal arteries and visceral arteries. Endarterectomy of the opening of the left renal artery was then performed. The distal anastomosis was at the level of the left and right renal arteries. The cross-clamp time was 60 minutes and ischemic time of the abdominal viscera was 40 minutes. The patient recovered remarkably well despite postoperative hemorrhage which required thoracotomy to control the bleeding.

Case 2

A 36-year-old man was referred from another hospital for repair of TAAA. He was a known case of chronic renal failure having been diagnosed as such for a six year period. Previously in the same year as he sought treatment, he had been admitted to the Department of Medicine, Chulalongkorn Hospital because of acute pulmonary edema and hypertensive crises. Two week prior to admission he was taken to the Police Hospital because of severe epigastric pain with tendered epigastric mass. CT scan showed a huge thoracoabdominal aortic aneurysm. An initial examination revealed blood pressure of 200/110 mmHg. The epigastric mass was pulsatile; its size was 12 cm in diameter. Laboratory tests showed BUN = 150 mg % and Cr = 12 mg %. MRI finding was fusiform aneurysm of the lower thoracic and whole abdominal aorta to the level of aortic bifurcation, and suspected stenosis of the left renal artery ostium. Both kidneys were small. During his hospital stay, he complained of severe abdominal and back pain, and his hematocrit dropped from 25 % to 18 %. The abdominal mass enlarged and become more tendered. Preoperative hemodialysis was done and the patient was operated on urgently. A thoracoabdominal approach through 5th and 7th intercostal spaces was performed. There was leakage from the aneurysm into the right retroperitoneal space. Surprisingly the orifices of both renal arteries were patently wide. Using the same technique as in the first patient, we resected the aneurysm and reimplanted the intercostal arteries, celiac axis, SMA, and both renal arteries into the graft. Distal

anastomosis was at the aortic bifurcation. The clamp time was 79 minutes and ischemic time was 54 minutes.

Results

Both patients survived the operations. The first patient required ventilatory support for four days. The second patient was extubated the morning after the operation. The bleeding point in the first patient was from the perigraft space which was controlled by suturing the aneurysm wall tightly around the graft. The renal function in the first patient was normal postoperatively. The second patient still had renal failure and required hemodialysis. No paraplegia occurred despite the ischemic times of 40 and 54 minutes, respectively.

Discussion

Despite improvement in survival rate, the incidence of serious complications after thoracoabdominal aortic operations has changed little.⁽²⁾ The incidence of postoperative paraplegia range from about 7% to 31%. The occurrence of immediate postoperative paraplegia is largely dependent on the degree of spinal cord ischemia during aortic clamping (the degree of ischemia is dependent on the diameter of available collateral arteries and the extent of the aneurysm) and the continuation of spinal cord ischemia due to a failure in reattaching critical segmental arteries successfully. The use of an aortofemoral shunt prevents ischemia during proximal anastomosis. Low-dose heparin reduces the risk of perioperative bleeding. Our patients did not have any thrombotic complications during the shunt perfusion. The home-made shunt is much cheaper than the commercially available Gott's (heparin-coated) shunt, and its manipulation for cannulation is much easier. Direct aortic cross-clamping without shunt or bypass limits the safety period of the operation to about 30 minutes, which may not be enough to carry out the complex reconstruction required for this type of aneurysm. Left aortofemoral bypass has the advantage of increasing the safe cross-clamp time, but it requires a higher dose of

IV heparin which may increase the incidence of bleeding complications. Even with the use of a centrifugal pump, systemic heparin is still required. The safe ischemic time for aortic cross-clamping without paraplegia is generally presumed to be 30 minutes. In both our patients, the ischemic times were longer than 30 minutes, but neither of them suffered paraplegia. One explanation for this favorable outcome is the reattachment of the lower intercostal arteries to provide a virtually uninterrupted blood supply to the spinal cord.⁽³⁾

The use of the shunt prevented an increase in the CSF pressure during aortic clamping. Such an increase in CSF pressure does interfere with the blood supply to the spinal cord through collaterals during aortic clamping. In conclusion, we recommend the use of low-dose heparin and a home-made aortic shunt in the repair of thoracoabdominal aortic aneurysm for the following reasons: the method is cheaper, no thromboembolism occurs, there are minimal bleeding problems, and the method prevents paraplegia and renal failure.

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