

Minimally Invasive Sternotomy for Aortic Valve Replacement Followed by a Minilaparotomy for Abdominal Aneurysm Repair

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ABSTRACT

Abdominal aortic aneurysms (AAAs) are commonly associated with severe coronary artery disease, but the incidence of associated aortic valve disease and AAAs in the general population is not known. The standard approach for surgical repair of AAAs is a laparotomy, and for aortic valve repair, a full sternotomy; results of both approaches are well documented. However, when AAAs and aortic valve disease occur concomitantly and both are symptomatic, they should be repaired during a combined procedure, with the aortic valve repair performed first. We describe the case of a 75-year-old patient with a symptomatic infrarenal AAA and severe aortic valve stenosis. To avoid an extensive surgical incision and shorten the recovery period, we performed a combined procedure in which we replaced the aortic valve through a ministernotomy and repaired the AAA through a minilaparotomy. The postoperative period was uneventful, and the patient was discharged home 6 days after surgery.

INTRODUCTION

The incidence of aortic valve disease associated with abdominal aortic aneurysms (AAAs) in the general population is not known, and the medical literature contains few reports of combined treatment [Neri 2002]. On the other hand, the association of AAAs with severe coronary artery disease (CAD) is well documented [Hertzer 1984], with the surgical strategies for simultaneous CAD treatment and AAA repair being well established [Wolff 2006]. In patients with concomitant aortic stenosis and AAA, however, the optimal surgical strategy remains controversial. In most cases, the aortic valve repair is performed first, followed by AAA repair after a rehabilitation period of 2 weeks to 2 months. In patients with a large or symptomatic AAA and severe aortic stenosis, repairing both during the same procedure may become necessary.

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We describe a patient with aortic valve stenosis and a concomitant infrarenal aortic aneurysm for which aortic valve replacement and AAA repair were performed in a combined procedure. On the basis of our past surgical success with minimally invasive techniques, we performed a combined surgical procedure, replacing the aortic valve through a ministernotomy and repairing the AAA through a minilaparotomy [Klokocovnik 1998, 2001].

CASE REPORT

A 75-year-old man with a history of shortness of breath and cigarette smoking was admitted to our institution for surgical repair of an infrarenal aortic aneurysm. Although the patient's condition was stable, he was experiencing abdominal pain. The patient's medical regimen included an angiotensin-converting enzyme inhibitor (10 mg/day), a beta-blocker (5 mg/day), and a statin (80 mg/day). A cardiac ultrasound evaluation revealed a heavily calcified aortic valve (valve area, 0.55 cm²; maximal aortic valve gradient, 99 mm Hg). Hypertrophy of the left ventricle with preserved contractility (ejection fraction, 55%) was also noted. A coronary angiogram showed patent coronary arteries without substantial atherosclerotic disease. A computed tomographic scan of the abdominal aorta showed an infrarenal aortic aneurysm measuring 65 mm wide and 120 mm long, with a 40-mm mural thrombus and a 0.6-cm aneurysmal neck. To minimize the patient's surgical trauma and discomfort and shorten the recovery period (especially because he was older), we decided to perform the aortic valve replacement and the AAA repair during the same procedure by using a minimally invasive approach.

After general anesthesia was administered, an upper ministernotomy was performed [Cosgrove 1996]. Antegrade blood cardioplegia was used to stop the heart, and intermittent blood cardioplegia was administered under direct vision to the left and right coronary ostia every 15 minutes (total arrest time, 52 minutes). After the calcified aortic valve leaflets were excised, an Epic tissue valve (St. Jude Medical, St. Paul, MN, USA) was sewn into place with intermittent pledgeted sutures. The aorta was closed with 4-0 polypropylene (Prolene) running sutures. The aortic clamp was removed, and the patient was weaned from cardiopulmonary bypass.

The total cardiopulmonary bypass time was 76 minutes. Heparin was reversed with the administration of protamine sulfate. The ministernotomy and skin were then closed in the usual fashion.

Immediately after closure of the sternal wound, an 8-cm minilaparotomy was performed (see Figure 1). Our technique of AAA repair through a minilaparotomy has previously been described [Turnipseed 2000; Klokocovnik 2001]. The infrarenal AAA had a short neck and was 7 cm in diameter. Heparin (1 mg/kg) was administered, and a cross-clamp was applied below the renal arteries. Both iliac arteries were also clamped. A mural clot was removed through a longitudinal incision of the aneurysmal sac, and the lumbar arteries were oversewn with 2-0 braided polyester (Ticron) sutures. Under direct vision, an 18-mm polyethylene terephthalate fiber (Dacron) tubular graft (Vascutek; Sulzer Vascutek, Renfrewshire, Scotland, UK) was sewn in end-to-end fashion with 2-0 Prolene running sutures. After blood flow was initiated through the graft, the aneurysmal sac was sewn around the graft with 2-0 Prolene running sutures. The retroperitoneum was closed in the usual fashion, and the wound was closed in layers. The total cross-clamp time was 30 minutes.



Figure 1. The patient on postoperative day 6. The 2 short incisions are clearly visible.

The patient was extubated 4 hours after surgery. The postoperative period was uneventful, and the patient was discharged home on postoperative day 6.

DISCUSSION

Because of our past good results with minimally invasive techniques, we combined the valve replacement and the AAA repair into one minimally invasive procedure for the surgical repair of this patient's severe aortic stenosis and symptomatic AAA [Klokocovnik 1998, 2001]. Endovascular stenting of the AAA was not possible because of the aneurysm's short neck and its close proximity to the left renal artery.

Staged surgical procedures for aortocoronary bypass and AAA repair have proved successful for patients in stable condition [Hertzer 1984]. Although combined surgical therapy is associated with a higher mortality rate, staged surgical therapy carries a greater risk of AAA rupture in the postoperative period [Wolff 2006]. For this reason, combined surgical therapy for CAD and AAAs has been proposed for patients whose symptoms are related to their AAAs [Hertzer 1984; Paty 2000; Wolff 2006]. In addition, the rehabilitation time and the cost of treatment are usually less with combined bypass grafting and aneurysm-repair procedures than with the staged approach [Cohn 1997; King 1998].

Recent studies have shown that minimally invasive techniques for aortic valve surgery may be more beneficial for patients than the classic sternotomy approach [Mihaljevic 2004; Salcuni 2005]; likewise, the minilaparotomy approach may be better for infrarenal aneurysm repair than the classic transperitoneal approach [Turnipseed 2000; Alpagut 2003; Leurs 2004; Chahwan 2007]. There is an agreement among reports in the medical literature that combined surgical procedures should be performed less invasively [Corso 2007].

CONCLUSION

Our experience with the patient we have described demonstrates that ministernotomy and minilaparotomy can be safely performed in a combined procedure for the treatment of aortic stenosis and AAA. The patient had less surgical trauma and postoperative discomfort and a faster postoperative recovery. He was able to be discharged home 6 days after surgery and is doing well after 1 year of follow-up.

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