I. Introduction

In the era of aging society, we often encounter the elderly patient with multiple vascular lesions. Many reports revealed that abdominal aortic aneurysm (AAA) is concomitant with coronary artery disease (CAD) in high frequency.

The optimal strategy of the treatment method of AAA and CAD is still controversial. In the two-staged operation, there are several factors which we should treat AAA or CAD first. The factors are the size of AAA, the presence of symptom, the severity of coronary stenosis, etc. On the other hand, simultaneous operation should be sometimes necessary. The major reason for the necessity may belong to the patient's condition whichever the patient cannot tolerate the interval until the second surgery or endure the two times of general anesthesia.

Conventionally, several simultaneous operations have been reported; On Pump CABG (Coronary Artery Bypass Grafting) + Surgical AAA repair, median sternotomy Off Pump CABG (OPCAB)+ Surgical AAA repair, or OPCAB + endovascular aneurysm repair (EVAR) was selected. The operation was performed safely, and postoperative course was uneventful. Although the candidate of the simultaneous operation was limited, this procedure provided a new alternative for the treatment of combined case of CAD and AAA.

KEY WORDS: abdominal aortic aneurysm (AAA), coronary artery disease (CAD), endovascular aneurysm repair (EVAR), kyphoscoliosis, minimal invasive direct coronary artery bypass grafting (MIDCAB)

II. Case report

A 75 years old male patient with severe kyphoscoliosis suffered from both coronary artery disease (CAD) and abdominal aortic aneurysm (AAA). Coronary angiography and multi-detector computed tomography showed severe stenosis of left anterior descending (LAD) artery. Difficulty of the catheterization into left coronary due to severe aortic meander suggested difficulty of catheter intervention. Computed tomography revealed an infrarenal AAA measuring 51 mm. The patient also had respiratory dysfunction. Two-staged surgery for both CAD and AAA were considered higher risk for the patient, simultaneous surgery of minimal invasive direct coronary artery bypass grafting (MIDCAB) and endovascular aneurysm repair (EVAR) was selected.

The operation was performed safely, and postoperative course was uneventful. Although the candidate of the simultaneous operation was limited, this procedure provided a new alternative for the treatment of combined case of CAD and AAA.

KEY WORDS: abdominal aortic aneurysm (AAA), coronary artery disease (CAD), endovascular aneurysm repair (EVAR), kyphoscoliosis, minimal invasive direct coronary artery bypass grafting (MIDCAB)
Because two-staged surgeries for both CAD and AAA were considered higher risk for the patient’s general condition, simultaneous surgery of minimal invasive direct coronary artery bypass grafting (MIDCAB) and EVAR was selected.

Under general anesthesia, bilateral common femoral artery was dissected for EVAR. Simultaneously the left internal thoracic artery (LITA) and saphenous vein (SVG) were harvested shortly through a left anterior small thoracotomy via the 5th intercostal space and the right lower leg. On the preoperative 3D CT, we confirmed the location of the intercostal incision (Fig. 3). First, EVAR was performed using Zenith Endovascular graft (COOK Medical, Bloomington, IN, USA). Thereafter, a short SVG was anastomosed between the LITA and the LAD, as so-called “H graft”, without using cardiopulmonary bypass (CPB). Transit time flow measurement showed diastolic flow pattern, and the intraoperative fluorescence imaging (IFI) revealed patent graft. The operation time was 200 minutes. The amount of bleeding was 110 ml. The patient could be awake from the general anesthesia and extubated just after the surgery in the operating room. Postoperative coronary CT showed good patency of coronary bypass graft (Red arrow), and no endoleak of AAA endovascular graft (Fig. 4). He discharged on postoperative day 15.
III. Discussion

Hertzer and colleagues reported that the frequency of CAD merged of AAA patients is over 30%. In Japan the frequency has reported as 27 to 47%. In order to reduce the perioperative risk of AAA, preoperative coronary artery evaluation should be essential.

In cases that AAA and CAD are coexisted, basically coronary artery therapy is often given priority. Pety and colleagues wrote that the interval to AAA surgery after CAD treatment is preferably about 2 weeks, and the risk of rupture of AAA will increase by opening more intervals.

However, for elderly patients with various complications, it may be difficult to perform the next surgery in two-weeks intervals. In such backgrounds, it has also been reported to perform the simultaneous operation of both surgical AAA repair and CABG, for cases with extremely large aneurysms or imminent rupture symptoms. However, the clinical results of the simultaneous procedures were insufficient and unacceptable. Wolff and colleagues reported that the 30-day mortality rate after the si-
multaneous surgery of on-pump CABG and surgical AAA repair was 15%, and the major adverse events were massive bleeding due to prolonged use of CPB. In addition, the effect of systemic inflammatory condition due to CPB usage and cardiac arrest results in damage not only to cardiac function but also respiratory and kidney function. Surgical invasion becomes considerable.

Morimoto and colleagues reported the simultaneous cases of off pump CABG (OPCAB) and surgical AAA repair. In their report, the surgical mortality rate of 0% was achieved for 10 cases.

The big problem in kyphoscoliosis patients with severe chest wall deformity is thought to be the difficulty of performing a midline sternotomy with symmetric retraction and adequate exposure that may be hampered by cardiac displacement and rotation. MIDCAB may be appropriate surgical approach to such patient.

We have actively carried out MIDCAB for single branch lesion since 1997, and we had experienced simultaneous surgery of MIDCAB and surgical AAA repair before. The results were satisfactory without postoperative complications and surgical death. However, the operation time tended to be long, this simultaneous procedure was not thought to be low invasive due to laparotomy.

In recent years, EVAR has been introduced as a treatment alternative to surgical AAA repair and its minimally invasive approach has been accepted by many high-risk patients and rapidly widespread. The number of elderly patients receiving EVAR has been progressing, because of their severe condition.

Kawarai et al had presented successful case underwent simultaneous operation of on pump CABG and EVAR. And Field et al reported 4 cases of OPCAB and EVAR. Their average operating time was not short as about 500 minutes, however, they achieved no-hospital death and no adverse complication.

In this report, we performed the lesser invasive procedure using both MIDCAB and EVAR for the elderly patient with severe conditions. In the case with severe kyphoscoliosis, median sternotomy is thought to be inadequate because postoperative thorax instability may occur, resulting pulmonary dysfunction and delay rehabilitation. Thereafter, MIDCAB procedure was selected as the best procedure. In our hospital, single coronary disease is ordinarily indicated for MIDCAB. In our routine MIDCAB surgery, the LITA is dissected with full length from 2nd costa to distal bifurcation for ensuring enough length. But especially in this case with kyphoscoliosis, the space between the LITA and the heart was very close due to the deformation of the rib cage (Fig. 3). If trying to harvest the LITA long enough to be used as an in-situ graft, it might compress the heart and collapse the hemodynamics. For this reason, so-called “H-graft” method was performed using the short segment SVG as the composite graft. In addition, to avoid damage to the rib cage, we needed to minimize the deployment of intercostal space (Fig. 5).

Since 2002, IFI has been performed routinely during CABG surgery in our hospital. This patient could be also extubated just after the surgery in the operating room, because the accurate graft patency was confirmed.

We would like to further increase the number of experienced cases in future and examine problems.

IV. Conclusion

The results of simultaneous surgery of MIDCAB and EVAR for high-risk patients with CAD and AAA are sufficiently acceptable. The operation strategy of MIDCAB and EVAR is minimally invasive.

Disclosure statement

We do not have any conflict of interest.
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