Complications of open stent-graft in treatment of aortic dissection

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Abstract

Open stent-graft has been used in the treatment of aortic dissection in recent years. Two device related complications happened in two patients. One was stenosis of the true lumen in the descending aorta caused by infolding of the distal end of the stent-graft immediately after its deployment. The other one was a new intima tear at the distal end of the stent-graft caused by full expansion of the stent-graft two years after stent-graft implantation. With the refinement of the device and enrichment of surgeons’ experience, such complications could be avoided in the future.

Keywords: Aortic dissection; Stent-graft

1. Introduction

Open stent-graft has been used in treatment of aortic dissection in recent years [1, 2]. We began using open stent-graft in 2004. The stent-graft is implanted into the descending aorta through the aortic arch under circulatory arrest. In most of our patients, intima tear in the descending aorta was sealed by the stent-graft and good results have been achieved. But severe complications related to the stent-graft have happened. Two device related complications were reported as follows.

2. Case report

2.1. Case one

A 42-year-old male presented to our hospital with chronic back pain for five years. Chronic Type B dissection with excessively distended false lumen and narrowed true lumen was diagnosed by magnetic resonance angiography (MRA) (Fig. 1). Since the initial entry tear was large (2.5 cm) and very close to the opening of the left subclavian artery, stent-graft implantation through femoral artery was considered unsuitable. Open stent-graft implantation was conducted using median sternotomy under moderate hypothermia circulatory arrest with unilateral antegrade cerebral perfusion. The arch diameter was 30 mm. An open stent-graft (Φ 26 mm × 100 mm, Cronus, Microport, Shanghai, China) was deployed into true lumen of the descending aorta through the aortic arch. The proximal end of the stent-graft was secured to the inner aortic wall with a 4-0-polypropylene running suture. After the operation, systolic blood pressure of the upper extremity was 80 mmHg higher than that of the lower extremity. The patient complained of inappetency and abdominal distension postoperatively. On postoperative day 10, a large amount of pericardial and left pleural effusion was found by echo. Blood test showed hypoproteinemia. Drainage of pericardial and pleural effusion was conducted. Computer tomography angiography (CTA) showed thrombosis of the false lumen and severe pseudocoarctation of the true lumen caused by infolding of the distal end of the stent-graft (Fig. 1). Right axillary artery to both right and left femoral artery bypass was conducted (8 mm, B. Braun, Germany). After the procedure, the difference between the upper and lower extremity blood pressure disappeared. The patient regained his appetite and recovered smoothly.

2.2. Case two

A 44-year-old male was admitted because of severe back pain 10 days before admission. Type A aortic dissection was confirmed by CTA. The patient received ascending aorta and arch replacement combined with stented elephant trunk implantation. The patient’s arch diameter was 28 mm. An open stent-graft (Φ 28 mm × 100 mm, Cronus, Microport, Shanghai, China) was implanted in the descending aorta through the aortic arch under circulatory arrest. The proximal end of the stent-graft was connected with a four-branched vascular graft (InterGuard, Intervascular, Datascop Company, France). The patient recovered smoothly. Two years later, the patient was readmitted because of sudden severe back pain. CTA showed a new
intima tear at the distal end of the stent-graft. Endovascular repair under local anesthesia was conducted in the catheter lab. A second stent-graft (Φ 28 mm × 120 mm, Grinkin, Beijing, China) was added at the distal end of first stent-graft by overlapping with the first one through the femoral artery (Fig. 2). Postoperative process was uneventful. Postoperative CTA showed that the new tear was sealed and thrombus formed in the false lumen.

3. Discussion

Open stent-graft has been used in treatment of aortic dissection since 2004 in our center. Our results are similar to those reported by Liu et al. [1]. Two cases of device related complications deserved to be reported. Cronus is the only commercial open stent-graft available in China now. It is 10 cm long and has a diameter from 26 mm to
32 mm. It consists of a Gianturco-type self-expandable metallic stent and a thick crimped woven Dacron graft. After deployment, the proximal portion of the stent-graft anchors in the aortic arch and the distal portion anchors in the true lumen of the dissected descending aorta. For each patient the size of the stent-graft is decided by the arch diameter. Since the aorta tapers from proximal to distal, in most patients, the true lumen diameter in descending aorta is smaller than that of the arch. Our recent study showed that in acute dissection, the arch diameter is about 20% larger than the true lumen’s diameter, while in chronic dissection, the taper ratio is approximately 30% [3]. When a relatively large stent-graft is implanted into a small true lumen, the distal end of the stent-graft cannot fully expand. Two things may happen. One is stenosis of the true lumen immediately after deployment caused by infolding of the stent-graft similar to what we had experienced in case one. The second one is an intima tear at the distal end of the stent-graft caused by the full expansion of the stent-graft in the future; just like what happened in case two. The design of the open stent-graft is much different from the stent-graft we implant through the femoral artery [4]. The stent-graft we implant in patients with aortic dissection through the femoral artery is tapered and flexible. Also it has a low profile. On the other hand, the current open style stent-graft is non-tapered, semi-rigid and has a large profile. Surgeons should be very cautious when this kind of stent-graft is used in chronic dissection with rigid intima flap and narrowed true lumen or in acute chronic dissection with fragile intima flap. Trans-esophageal echo during an operation and close postoperative imaging follow-up may help with prevention and early detection of the complications. If a proper stent-graft is not available, the traditional procedure is also a choice for these two patients.

With the refinement of the device and enrichment of surgeons’ experience, complications reported here could be avoided in the future.

References