Clinical Research

Percutaneous coronary intervention following repair of type B aortic dissection: a report of 8 cases

Quanmin Jing¹, Xiaozeng Wang¹, Yaling HAN¹, Bo Luan¹, Geng Wang¹, Xiaojiang Liu², Hongxu Jin³

1. Department of Cardiology, 2. Department of anesthesiology and 3. General surgery, Shenyang Northern Hospital, Shenyang 110016, China

Objective Patients with aortic dissection have a significant incidence of coronary artery disease. The purpose of this study is to evaluate the safety and feasibility of percutaneous coronary stent in patients who have undergone endovascular stent, and to assess the effect of anti-coagulant and anti-platelet treatment on patients’ thrombosis process. Methods From January 2005 to July 2007, 8 patients who had undergone endovascular stent-graft during the past 1 to 7 months for type B aortic dissection repair, underwent PCI because of coexisting coronary artery disease. Anti-coagulant and anti-platelet treatments were administrated after PCI according to the standard protocol. Patients were followed up for a mean period of 23 months. Clinical and false lumen status data were collected during the follow-up. Results PCI were technically successful in all 8 patients and no severe complications such as death, paraplegia, renal failure occurred during hospitalization. Complete false lumen thrombosis was observed in 5 patients and incomplete false lumen thrombosis in the remained 3 patients at the end of follow up. There were no major complications such as death, dissection rupture or aneurysm development occurred during the follow-up period. Conclusion Our data implied that PCI can be safely performed in patients with type B aortic dissection who have undergone endovascular stent-graft, without interrupting the thrombosis process. (J Geriatr Cardiol 2008; 5: )

Key Words aortic dissection; coronary artery disease; percutaneous coronary intervention; stent-graft

Introduction

Aortic dissection and coronary artery disease (CAD) share common risk factors, such as hypertension, smoking and dyslipidemia. Patients with AD have a significant incidence of coronary artery disease. Creswell et al. demonstrated that 35% of patients with acute type A dissection who underwent coronary angiography had at least one lesion with >50% narrowing resulting in 50% of these patients undergoing CABG at the time of emergency aortic repair. In an autopsy study, Larson and Edwards found chronic CAD in 22% (27 out of 121) of patients with type I or II aortic dissection. Endovascular stent–graft closure of the proximal entry tear has been accepted widely as a treatment of choice for selected patients with type B aortic dissection in recent years. In addition to promptly averting serious end-organ ischemia or infarction, it was assumed that stent–graft placement over the intimal tear could prevent the eventual formation of an aneurysm by facilitating complete thrombosis of the thoracic aortic false lumen, and even incomplete thrombosis of the false lumen was assumed be advantageous. However, a recent study showed that incomplete thrombosis of the false lumen is associated with higher mortality in patients with AD. Therefore, physicians may face a dilemma in the management of patient with aortic dissection complicated by acute coronary syndromes, because anticoagulant and anti-thrombotic therapy is the cornerstone treatment for the latter, but is usually considered being contraindicated in the former conditions.

Here, we reported 8 cases who underwent percutaneous coronary intervention following endovascular repair of type B aortic dissection, for the treatment of acute coronary syndromes, as a pilot observational study to evaluate the safety and feasibility of percutaneous coronary stent in patients who have undergone endovascular stent, and to assess the effect of anti-coagulant and anti-platelet treatment on patients’ thrombosis process.

Patients and methods

Between January 2005 and July 2007, 8 patients (10.2%) from a total of 43 consecutive patients with type B aortic dissection complicating CHD underwent combined treatment of endovascular stent-graft and percutaneous transluminal intervention at Shenyang Northern Hospital. The demographic, clinical, angiographic, and procedural data were recorded. Among these 8 patients, 7 were male and 1 was female. The mean age was 58.6 ± 8.0 years (ranging...
Completion angiography is performed to confirm proper
tolic arterial blood pressure is lowered to 80-100 mm Hg.
the stent-graft. During the release of the device, the sys-
the neck sites. Once the desired location is reached, the
information, considering aortic wall status and diameter at
abnormality. The exact placement site is selected on the
over and positioned at the proximal end of the aortic
fluoroscopic guidance via the right femoral artery access,
and by 10%–15% in all other cases.
changes in the aortic diameters of the aortic lesion and the aortic segments
bus or calcifications; (c) the exact intraluminal measurements
limitation of 34-38 mm×100-140 mm
tent of thrombosis in the false lumen, the size of the true and
false lumen, and blood flow through the branch vessels
reconstruction of the aorta was made to determine the ex-
status of thrombosis in the false lumen, the size of the true and
false lumen, and blood flow through the branch vessels
Per-procedural treatment and imaging
All the patients were treated with hypotensive drugs
to keep the blood pressure <120/80mmHg. Unenhanced and
contrast-enhanced computed tomographic (CT) angiogra-
phy from the thoracic inlet to the femoral artery bifurcation
was performed to confirm the diagnosis, and the character-
istics of the dissection were recorded, such as the total
number, the location, the length, the diameter, the distance
from the dissection to left subclavical artery, and others. An
angiogram of the thoracoabdominal aorta and pelvis was
performed through left radial artery to assess the aortic le-
sion and the vascular access. The following information were
obtained: (a) the location of the aortic lesion and its exact
anatomy and morphology; (b) the presence of mural throm-
bus or calcifications; (c) the exact intraluminal measurements
of the diameters of the aortic lesion and the aortic segments
proximal and distal to it; (d) the relationships of the aneu-
rysm neck with adjacent aortic branch vessels, mainly the
left subclavian artery (LSA) and celiac trunk; and (e) the
anatomy of the abdominal aorta and the size and tortuosity
of femoral and iliac vessels. At the same time, coronary an-
giography was performed to determine the coronary artery
diseases.

Endovascular stent-grafting
All procedures were performed by a team of
interventional radiologists and vascular and cardiac sur-
geons in the operating room with the patient under general
anesthesia. The dimensions of the stent-graft used are de-
termined on the basis of contrast-enhanced CT images and
angiographic images. Stent-grafts are selected according to
the aortic diameter and length of the lesion. For optimal
fixation, all stent-grafts are oversized in diameter compared
with the diameter of the proximal and distal necks of the
lesion, by 15%–20% in cases of atherosclerotic aneurysms
and by 10%–15% in all other cases.

A guidewire was inserted into the aortic arch under
fluoroscopic guidance via the right femoral artery access,
and then the delivery system of the stent-graft was passed
over and positioned at the proximal end of the aortic
abnormality. The exact placement site is selected on the
basis of contrast-enhanced CT and angiographic
information, considering aortic wall status and diameter at
the neck sites. Once the desired location is reached, the
outer sheath is withdrawn to complete the deployment of
the stent-graft. During the release of the device, the sys-
tolic arterial blood pressure is lowered to 80–100 mm Hg.
Completion angiography is performed to confirm proper
stent-graft placement and to verify the presence of correct
perfusion through the graft without perigraft leakage. After
removal of the delivery system, the vascular access is closed
by standard surgical closure techniques. No further antico-
gulation is administered.

Percutaneous coronary stenting
Percutaneous coronary intervention was performed
through right radial artery according to the ACC/AHA
guideline. Briefly, aspirin (at a dose of 100 to 500 mg) and
clopidogrel (300 mg) were administered when patients first
arrived at the hospital. A glycoprotein IIb/IIIa receptor blocker
was administered at the discretion of the operator. A bolus
of 10,000 IU of unfractionated heparin was administered
before the procedure. Coronary angiography was performed
through the radial artery. The target segment was filmed in
at least two orthogonal planes after the intracoronary ad-
mistration of 100 to 200 µg of nitroglycerin; quantitative
coronary angiography was then performed. After PCI, 75 to
100 mg of aspirin daily was given for life and 75 mg of
clopidogrel daily for at least 6 months.

Follow up
Patients were followed up once monthly either through
visiting the outpatient clinic, or by telephone or letters. Blood
pressure level was monitored. A conventional CT or MRI
reconstruction of the aorta was made to determine the ex-
tent of thrombosis in the false lumen, the size of the true and
false lumen, and blood flow through the branch vessels
prior to discharge and at 1, 3, 6, 9, and 12 months after
discharge, and yearly thereafter. The status of the false lu-
men on imaging was classified as patent if flow was present
in the absence of thrombus, as partially thrombosed if both
flow and thrombus were present, or as completely throm-
bosed if no flow was present.

Results

Procedure outcomes
Aortic and coronary angiography showed, there were
2 entry tears in 1 patients, and there was 1 entry tear in the
other 6 patients; the entry tear located 0-10 mm below
the left subclavian artery (LSA) in 1 patient, 11-30 mm below
LSA in 4 patients, and 31-50 mm below LSA in 3 patients;
the dissection involved renal artery and other arteries be-
low in 7 patients. All the patients were treated with the place-
ment of an endovascular stent-graft (34-38 mm×100-140 mm)
across the entry tears. Seven of the grafts were Talent from
Medtronic inc. and 1 was Aegis from Microport Surgical
Science Inc. Endovascular stent-graft placements were suc-
cessfully completed in all the patients. The entry tears were
completely closed in 4 patients, and mostly closed in the
other 4 patients; however, true lumen area of the descend-
ing aortic arteries significantly increased and the ischemic

from 43 to 76 years). The average time from symptom onset
to endovascular stent-graft repair for aortic dissection was
17.5±12.6 days (ranging from 1 to 45 days). Four patients
had hypertension, 3 had diabetes mellitus, 1 had renal
dysfunction, and 1 had cholelithiasis.
syndromes were significantly improved. Coronary angiography revealed single vessel disease in 4 patients, double-vessel disease in 3 patients and triple-vessel disease in 1 patient. The mean reference diameter of target vessels was 3.5±0.3 (3.0-4.0) mm and the mean stenosis rate was 85.6±14.0%. A total of 12 stents were implanted into 11 target vessels, of which 7 in left anterior descending coronary, 3 in left circumflex coronary, and 2 in right coronary artery, with an angiography success rate of 100% and no serious complications.

Clinical outcomes

No patients suffered angina pectoris, acute or subacute thrombosis, heart failure, death or other major adverse cardiac event. Although two patients still have back pain after procedure, enhanced CT showed no enlarged entry tear, the pain disappeared after symptomatic treatment, and no other complications happened in hospital. All the patients were followed up for 1-31 (18.0± 8.5) months. No patient died, suffered heart or renal insufficiency, late thrombosis, or other event in the follow up period. One patients have discontinuous chest pain, and aorta and coronary angiography showed no residual leak at the entry of the previous dissection, and no in-stent restenosis. Enhanced CT for all patients at 6 months after procedure showed no enlarged true lumen, no leakages were detected. No Cerebral, abdominal or other hemorrhage were found during the follow up period.

False lumen thrombosis

Complete false lumen thrombosis was observed in 2 of the 3 patients with thoracic aortic dissection, and 3 of the 5 patients with abdominal aortic dissection at the end of follow up. Partial thrombosis was evident in the remained 3 patients with either thoracic or abdominal aortic dissection.

Discussion

Aortic dissection is a serious life-threatening disease in which there is bleeding into and along the wall of the aorta. Over 60% aortic dissections does not stop tearing and ultimately become a fatal rupture. Previous studies showed, 14- 20% Stanford B aortic dissection with conservative therapy developed into aortic aneurysm. In recent years, endovascular stent-graft treatment has been raised as an alternative to open surgery. Dake et al reported a procedure success rate of 83% for stent-graft treatment with thoracic aortic aneurysm. And the morbidity and mortality associated with endovascular repair are significantly lower than those associated with open surgery. In the largest surgical series, the mortality ranged from 5% to 20%. In studies of endovascular repair, the 30-day mortality was 0%-20% and the periprocedural stroke rate was 0%-7%. Since 2002, our centre have performed endovascular stent-graft placement on 78 cases with a success rate of 98.7%.12

An enormous literature has reported the application of endovascular stent-graft on the treatment of aortic dissection, but the combination of endovascular stent-graft and coronary stent is little reported. Acute coronary syndrome and aortic dissection are all emergency events in cardiovascular system. The treatments of the two diseases are different, and even controversial. After PCI for ACS, anti-platelet and anticoagulation medications must be taken, but for aortic dissection, anti-platelet and anticoagulation therapy should be avoided. Thus, the combined treatment of endovascular stent-graft placement for dissection and PCI for ACS become a challenge to battle for cardiovascular specialist.

In our department, we performed stent-graft at first, and 3-7 days later, after the dissection had been confirmed to be closed, we performed PCI for coronary lesions. The time when to perform PCI should depend on the clinical result of endovascular stent-graft placement, thrombus organization in the dissection, new tear after stent-graft and other matters. In this selected population, 2 bare metal stents and 6 drug eluting stents were used. The selection of stents should try to shorten the anti-platelet periods.

The time from stent-graft to PCI is still under debate, and it had better to be 3-6 months for the healing of the dissection. However, usually, ACS is unable to tolerate such a long time and must be dispose as soon as possible. The time to perform PCI should also base on the Severity of the coronary lesions. In our study, 1 patient was found a 95% stenosis in LAD, but 3 days later it developed AMI, and angiography showed 100% occlusion of the artery. We performed emergency PCI for the patient and obtained a good clinical outcome.

This study evaluated the outcome of anti-platelet therapy after endovascular graft-stent placement for aortic dissection and PCI for ACS and found it was safe and effective, and the routine anti-platelet therapy did not delay the closure of internal fistula.

For the patients with Stanford type B dissection concomitant with coronary artery disease, open surgery of descending aorta replacement and coronary artery bypass grafting may lead to a high mortality rate, especially for the elderly patients who are often complicated by heart, brain and lung diseases. So the best therapy for this patient population is combined percutaneous intervention of aortic dissection and coronary lesions. From the experiences of this study, we found: ?A small residue fistula after endovascular stent-graft placement for aortic dissection may self-cure, and does not influence the following PCI and the related anti-platelet therapy. In this study, there were residual fistula after stent-graft in six cases, but reangiography showed the fistula disappeared in 4 cases, and decreased in the other cases. ?Drug eluting stents can be used in the patients with Stanford type B dissection concomitant with
coronary artery disease. In this study, 8 patients were implanted with DES, and administrated with clopidogrel for 4-6 months. All the patients were followed up for 18 months, and no death, internal fistula or major adverse cardiac event happened.

**Conclusion**

For the patients with Stanford type B dissection concomitant with coronary artery disease, combined endovascular stent-graft placement and percutaneous coronary stenting may lead to a good outcome. However, due to a small sample size in this study, more sample and longer follow up period should be set to evaluate the long-term outcome.

**References**