Case report

Percutaneous fenestration of the aortic dissection membrane in malperfusion syndrome

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Abstract

We present two cases of malperfusion syndrome due to aortic dissection type-B. A supra-renal blind sac phenomenon resulted in renal failure and absent femoral pulses in both patients. Additionally, one patient suffered from spinal cord ischemia, the other from severe abdominal pain. By interventional techniques, catheter perforation of the blind sac was achieved. The resulting re-entries were enlarged with a balloon catheter. Distal perfusion without pressure gradients was restored by this technique in both patients and resulted in complete relief of symptoms. Percutaneous fenestration of the aortic dissection membrane may be an alternative to operative treatment in malperfusion syndrome.

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1. Introduction

Despite major progress in the surgical treatment of aortic dissection, concomitant organ malperfusion may pose serious problems and is responsible for a considerable amount of morbidity and mortality in current series [1,2]. Classic treatment consists of aortic replacement or operative fenestration of the dissection membrane to restore perfusion of the affected organs [2,3]. The advent of interventional techniques offers new possibilities to approaching this problem [4–7].

2. Presentation of cases and interventional techniques

2.1. Case 1

A 47-year-old male presented with lower limb paresthesia and renal failure requiring dialysis (creatine 8.7 mg/dl, blood urea 210 mg/dl, creatinine clearance 16 ml/min).

2.2. Interventional procedure

Under surgical standby percutaneous balloon fenestration was performed via the left femoral artery with a 10 Fr. Sheath (Cook, Europe; Bjaeverskov, Denmark) The dissection membrane was perforated using a Roesh-Uchida needle.
(Cook, Europe), in combination with a 5 Fr. catheter and 20 G. Nitinol needle (Fig. 2). To prevent inadvertent extraluminal perforation of the needle, the membrane puncture was performed under fluoroscopy in different planes from the narrow to the wide lumen, i.e., from the true to the false lumen. After membrane puncture and removal of the needle, the correct position of the 5 Fr.-catheter was assessed by injection of 2–3 ml radioopaque solution (Ultravist 150 or 300, Schering, Berlin, Germany). Then a 0.035 inch Amplatz-guiding wire (Boston Scientific, Ratinger) was positioned in the false lumen. The membrane was then dilated with a 16 mm balloon catheter (XXL, Boston Scientific, Ratinger).

Since a tendency for restenosis of the elastic dissection membrane was observed, a Palmaz Stent (P308, Cordis, Haan) was inserted and dilated up to 16 mm (Fig. 3).

A Palmaz stent (P 154, Cordis, Haan) was also implanted into the left renal artery.

Following the intervention, distal perfusion was restored without any pressure gradient between the aortic arch and the femoral artery. The patient received heparin intravenously for a partial thromboplastine time of 60–80 s for 3 days. Aspirin 100 mg/day and ticlopidin (Ticlyd, Sanofi Winthrop, Munich, Germany) 500 mg/day were additionally administered.

The patient’s general condition improved rapidly. Blood pressure normalized and the symptoms of lower limb paresthesia disappeared immediately after the intervention. Urine output and renal function returned, and the pulses in the lower limbs were palpable. All laboratory values had returned to normal within 7 days.

Computed tomography at discharge and 1 month later demonstrated an open reentry at the lower part of the dissection. The patient was in excellent general condition and returned to work.

2.3. Case 2

A 41-year-old female presented with severe abdominal and back pain, renal failure and severe hypertension. The pulses in the lower extremities were not palpable. Serum creatinine was 5 mg/dl, blood urea 164 mg/dl, and serum lipase 364 units/l.

Computer tomography and angiography showed type-B dissection of the aorta. The dissection membrane started above the diaphragm and continued down to the aortic bifurcation.

As in the first case, percutaneous fenestration by perforation and dilatation of the dissection membrane of the lower thoracic and abdominal aorta was performed. An ostial dissection of the left renal artery was treated by placement of a Palmaz stent (P154, Cordis, Haan).
After intervention, the same anticoagulation management as in case one was performed. Following fenestration, abdominal symptoms resolved immediately and completely. No pressure difference between the aortic arch and abdominal aorta was observed and blood pressure returned to normal. Affected laboratory values also returned to normal within 5 days (creatinine 0.87 mg/dl, blood urea 43 mg/dl).

Renal function scintigraphy was performed with 125 MBq Tc-99m MAG-3 (TechneScan) before and after percutaneous fenestration and demonstrated a total improvement of 50% of the tubular extraction fraction of the left kidney.

3. Discussion

Malperfusion syndrome due to aortic dissection may result in a severe decrease in the blood supply to the visceral, renal, spinal cord or lower limb arteries and is observed in up to 30% of the patients with aortic dissection [8].

Surgical fenestration of the dissection membrane or operative replacement of the aorta are the standard therapies for aortic dissection with concomitant malperfusion. De Bakey et al. [9] reported the first two cases treated surgically. The perioperative morbidity of surgical fenestration and of aortic replacement in this situation is high and mortality may reach as much as 25% [1,10].

There are sporadic studies about percutaneous fenestration with different organ ischemia due to aortic dissection [4–7]. As with our patients, good clinical results were reported. We observed no complications in both cases. However, complications such as aortic wall perforation, extension of the dissection and distal embolization could occur. Therefore, we think surgical standby is mandatory.

As a result, percutaneous fenestration of the aortic dissection membrane in malperfusion syndrome may be of special value to high risk patients with multiple concomitant diseases.

In our first patient, we were reluctant to perform surgery because of his reduced general condition, and the concomitant neurological and renal failure which continued for two months after the aortic dissection. Clamping of the aorta during thoracotomy and even a slight additional ischemia might have worsened the neurological symptoms signalling a borderline spinal cord perfusion. Therefore, we decided on percutaneous fenestration. Based on the history of rapid improvement with complete resolution of all symptoms in this case, the second patient was also treated by interventional techniques.

Both patients will be checked regularly in our outpatient clinic by control examinations including computer tomography every half year. If the aortic diameter increases significantly, or if other symptoms develop, surgical replacement of the aorta is indicated according to current standards [1].

We conclude that percutaneous fenestration may be a safer and less invasive alternative to surgical treatment of malperfusion syndrome due to descending aortic dissection.

References


