Treatment of an arteriovenous fistula by the placement of a Z-stent and embolization in a patient with nephrotic syndrome

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Introduction

Thrombosis is one of the major complications of nephrotic syndrome, especially in patients with membranous glomerulonephritis [1, 2]. Pulmonary emboli and deep- and renal-vein thromboses occur frequently [1, 3]. Some of the pathophysiological mechanisms proposed are (1) increased platelet availability at the vessel wall [4], (2) decreased red blood cell deformability [5], (3) increase in von Willebrand factor [5], (4) hyperfibrinogenemia [1], and (5) decreased levels of antithrombin III [1]. Treatment for arterial or venous thrombosis using a Fogarty catheter is both popular and useful. We report on a case of left common iliac vein thrombosis treated with a Fogarty catheter in 1981 who developed an interesting complication 10 years later which responded to a unique treatment.

Case report

A 31-year-old man with proteinuria was referred to another hospital for evaluation in April 1981. He did not have any significant past medical history and his family history was unremarkable. The laboratory data were as follows: proteinuria 10 g/day, total serum protein 5.2 g/dl and serum albumin 2.2 g/dl. He was diagnosed as having nephrotic syndrome of unknown aetiology and was discharged when his oedema resolved spontaneously. In June of 1981, he was admitted to our hospital for examination of a swelling in his left leg which was due to thrombosis of the left common iliac vein. The data on admission were as follows: total serum protein 5.8 g/dl, serum albumin 2.8 g/dl, blood urea nitrogen (BUN) 17.2 mg/dl, serum creatinine 1.0 mg/dl, total cholesterol 322 mg/dl, proteinuria 5.0 g/day, haemoglobin 15.3 g/dl, haematocrit 46.0%, erythrocyte sedimentation rate 73 mm/h, prothrombin time (PT) 10.0 s (control 10.3 s), activated partial thromboplastin time (APTT) 21.9 s (control 24.9 s), fibrinogen 723 mg/dl, fibrin/fibrinogen degradation products (FDP) 40 mg/l, coagulation factor V 108%, factor VII 104%, factor VIII 120%, factor IX 111% and factor X 102%. The thrombus was successfully removed using a Fogarty catheter, but some stenosis of the left common iliac vein could still be demonstrated (Figure 1) due to residual thrombi on the venous wall. He was administered 2–4 mg/day

Fig. 1. The angiogram following the use of the Fogarty catheter in 1981 showing stenosis of the left common iliac vein.
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Fig. 2. Arteriovenous fistula composed of the left common iliac vein, left external iliac vein, left 4th lumbar artery, left internal iliac artery, left 3rd lumbar artery, and right 3rd lumbar artery.

Fig. 3. Placement of the Z-stent in the left common iliac vein.

Fig. 4. Angiogram after placement of the Z-stent.

of warfarin potassium to keep the thrombotest (TT) at 10–30%. Histopathological diagnosis of renal biopsy performed in November 1981 was membranous glomerulonephritis. After discharge from our hospital he received treatment at another institution, where anticoagulant therapy was continued until 1987.

Beginning in 1991 the swelling in his left leg recurred and increased gradually. He was readmitted to our hospital in 1994 and anticoagulant therapy was immediately started at 2 mg/day of warfarin potassium. The data on admission were: total serum protein 7.5 g/dl, serum albumin 4.4 g/dl, BUN 25.1 mg/dl, serum creatinine 0.8 mg/dl, total cholesterol 166 mg/dl, proteinuria 0.6 g/day, haemoglobin 14.4 g/dl, haematocrit 43.1%, PT 95.6%, APTT 113%, TT 40%, fibrinogen 524 mg/dl, FDP 6 mg/l, protein C (antigenic assay) 120% and protein S (antigenic assay) 120%. Computed tomography (not shown) revealed several distended veins and collaterals suggesting, but not proving, the presence of an arteriovenous (AV) fistula. The latter, however, was demonstrated by angiography which showed a fistula comprising the left common iliac vein, left external iliac vein, left internal iliac artery, left 4th lumbar artery, left internal iliac artery, left 3rd lumbar artery and right 3rd lumbar artery (Figure 2). Initial therapy consisted in embolization of the arteries feeding the AV fistula using a metallic coil and gelatin sponge particles. The swelling, however, did not improve. In October 1994, another feeding vessel from the inferior epigastric artery was detected. Embolization therapy using cyanoacrylate and lipiodol was performed without symptomatic improvement. The AV fistula persisted and this was felt to be due to the continued stenosis of the left common iliac vein. A balloon catheter was used before placement of a Gianturco Z-stent. Then a Z-stent, 20 mm in diameter and 5 cm in length, was placed at the stenotic site of the left common iliac vein (Figure 3). Embolization therapy for the feeding arteries was repeated at the same time. Placement of the Z-stent was effective in expanding the stenosis and suppressing the growth of the arteries feeding the AV fistula (Figure 4). There were no symptoms of lumbar ischaemia following treatment. The TT was maintained at 10–30% by the administration of warfarin potassium. The swelling of the left leg improved and in June 1996, the AV fistula was checked by computed tomography. The diameter of the patient’s left leg remained the same as in 1994.
Discussion

Venous thrombosis is one of the major complications of nephrotic syndrome. Patients with membranous glomerulonephritis suffer a high rate of morbidity due to thrombosis [1,2]. The case presented herein is an example of one such episode and its successful treatment. Several complications resulting from the use of Fogarty catheters have been reported including rupture of the balloon, perforation of the vessel, disruption of the intima, pseudoaneurysm formation, arteriovenous fistula and injury to the arterial wall by a metal-tipped spring catheter [6]. The occurrence of AV fistula seems to increase in the presence of pre-existing atherosclerotic disease, which increases the chances of intimal injury and requires multiple procedures for removal of thrombi [6]. However, venous wall injury after the use of Fogarty catheters is not common. In the present case, the stenosis of the left common iliac vein had been confirmed by angiography after treatment with a Fogarty catheter in 1981. Such stenosis might be due to remaining thrombi and fibrosis of the venous wall. The relationship of AV fistulae to venous hypertension has also been described. Terada et al. [7] reported that chronic venous hypertension lasting 2 to 3 months can induce new AV fistula formation by affecting the dural sinuses or the subcutaneous tissue in rats. The stenosis of the left common iliac vein might have induced venous hypertension in the present case leading to the swelling of the left leg which developed gradually over the 10 years following the use of a Fogarty catheter.

An additional element in this case was the discontinuation of anticoagulation after 6 years, which was followed by the gradual accumulation of oedema in the left leg. Conceivably, the administration of anticoagulant prevented the further development of the venous stenosis notably present in 1981 and also AV fistula formation caused by the stenosis.

The Z-stent has been employed to treat venous stenosis in haemodialysis patients or inferior vena cava obstruction secondary to malignancy [8]. A Z-stent can expand the venous lumen and reduce venous hypertension. In the present case, the Z-stent was successfully employed to expand the stenosis of the left common iliac vein. We propose that venous hypertension was a major factor in the AV fistula formation in the present case and the Z-stent, by reducing the pressure, prevented new AV fistula formation since embolization therapy alone was unsuccessful. Complications associated with the use of Z-stents include migration or misplacement of the stent, fracture of the stent wire, haemorrhage, thrombosis, fever, rupture of a vessel, and overstretching [9,10]. To date, no such complications have arisen in the present case and the patient remains clinically stable.

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References


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