Femoral and iliac vein stenoses after prolonged femoral vein catheter insertion

Waclaw Weyde\(^1\), Roman Badowski\(^2\), Magdalena Krajewska\(^1\), Jozef Penar\(^1\), Krzysztof Moron\(^2\) and Marian Klinger\(^1\)

\(^1\)Department of Nephrology and Transplantation Medicine and \(^2\)Department of Radiology, Wroclaw University of Medicine, Wroclaw, Poland

Abstract

Background/Aims. Catheterization of the femoral vein is a safe and recommended method of temporary access for haemodialysis. In some patients, however, because of the lack of other possibilities, it is necessary to maintain long-term femoral cannulation. The aim of the study was to evaluate the frequency of stenosis after prolonged femoral cannulation.

Methods. The 24 patients incorporated in the study were divided into two groups. Group 1 consisted of 10 end-stage kidney failure patients (four females and six males, aged 32–75 years, average 55.6 ± 13.6 years) in whom femoral catheters were maintained for less than 2 weeks (5–14 days, average 9.3 ± 3.6 days). Group 2 included 14 chronic haemodialysis patients (six females and eight males aged 23–65 years, average 49.5 ± 13.27 years). The time of catheter maintenance ranged from 2 to 16 weeks (average 6.4 ± 4.2 weeks). Femoral and iliac vein status was evaluated using magnetic resonance imaging.

Results. A feature of venous stenosis of both the femoral and iliac veins was disclosed in four patients in whom femoral catheters were maintained for more than 4 weeks. There were no stenoses in group 1.

Conclusion. Long-term femoral cannulation for more than 4 weeks may be associated with a significant risk of stenosis in the femoral and/or external iliac veins.

Keywords: catheter insertion; femoral vein stenoses; haemodialysis; iliac vein stenoses

Introduction

Femoral vein catheterization is the easiest and the safest method of obtaining temporary vascular access for haemodialysis. Modern femoral catheters are made from relative flexible materials and may remain in place for longer than the 72 h recommended in most guidelines. Additionally, patients with such catheters do not have to be immobilized and the haemodialysis procedure can be performed on an ambulatory basis. Our own and others’ experience confirms the relatively low risk, even when the catheter is not removed for 2 weeks [1,2].

In an increasing number of patients in whom jugular catheter placement is impossible and the creation of permanent access in the forearm and upper arms has failed, a femoral catheter has to be maintained for longer time periods.

Data on the long-term complications of femoral catheterization are very limited [3], although late complications concerning the upper limb, such as stenosis post catheter insertion, which ranges from 20 to 50% in subclavian veins and up to 10% in internal jugular veins, are well known [4–6].

Therefore, the aim of our study was to estimate the frequency of venous stricture in patients with a femoral catheter indwelling for more than 2 weeks.

Patients and methods

The study was performed in our centre, which is a tertiary centre for all patients in whom vascular access problems have occurred in the local dialysis unit serving a population of 2.9 million persons. The 24 patients incorporated in the study were divided into two groups. Group 1 consisted of 10 end-stage kidney failure patients (four females and six males, aged 32–75 years, average 55.6 ± 13.6 years) in whom the duration of catheterization was less than 2 weeks (5–14 days, average 9.3 ± 3.6 days).
The iliac and femoral veins were examined with a 1.5 T imaging system (Edge Eclipse, Picker International, Inc.). MR venography was performed using non-enhanced two-dimensional time-of-flight imaging sequences including a travelling presaturation to suppress the arterial signal. Parameters were: repetition time (ms)/echo time (ms), 29-30/7; section thickness, 2–2.5 mm; gap, –0.5 mm; flip angle, 40; field of view, 240–290 mm; and matrix, 128 × 256. Post-processing images were reconstructed with the maximum intensity projection technique.

To eliminate detection of transitory thrombosis, MRI examination was performed no sooner than 3 months after removing the catheter.

### Results

No stenoses were disclosed in Group 1.

In Group 2 we confirmed changes in four patients (29%), which are presented in Table 2. The time of maintaining the catheters refers only to a single vessel (Figures 1–4).

All of the changes occurred after maintaining the catheter for longer than 4 weeks and applied to the vessel in which the catheter was maintained. However, in the remaining five patients of this group, in whom catheters were also maintained for longer than 4 weeks, the thrombotic complications did not occur.

There were no diabetic patients in the group of stenotic complications. In this group of patients, the direct course of the cannulation procedure was uneventful, especially as no local and retroperitoneal bleeding was observed.

Among the four patients in whom the vein stenoses were proven by MRI examination, two patients who had the changes on both sides also showed clinical symptoms of venous obstruction (oedema of the leg). However, in the remaining two patients there were no unfavourable clinical symptoms.

In one patient who had the vessel changes occurring on one side, a successful kidney transplant operation was performed, and in the remaining three patients permanent vascular access was gained.

### Table 2. Detailed data of venous stenoses in four patients

<table>
<thead>
<tr>
<th>Features of stenosis and diminished blood flow</th>
<th>Number of patients</th>
<th>Duration of cannulation of femoral vein in weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Femoral veins on both sides</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Femoral and external iliac vein on one side</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Femoral veins bilaterally and external iliac vein on one side</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>External iliac vein on one side</td>
<td>1</td>
<td>8</td>
</tr>
</tbody>
</table>

### Table 1. Causes of end-stage kidney failure in the investigated patients

<table>
<thead>
<tr>
<th>Primary kidney disease</th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetic nephropathy</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Chronic glomerulonephritis</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Polycystic kidney disease</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Secondary amyloidosis</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Intersitial nephropathy</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Hypertensive nephropathy</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

Short-term maintenance of the catheter was applied in patients with transient complications with vascular access and in patients starting haemodialysis with respiratory failure.

Group 2 included 14 chronic haemodialysis patients in whom, in the period from December 1997 to January 2001, the necessity of maintaining a femoral catheter for longer than 2 weeks arose (average 6.4±4.2 weeks, minimum 2, maximum 16). This group of patients contained six females and eight males, aged 23–65 years, 49.5±13.27 years on average.

The causes of end-stage kidney failure in both groups are shown in Table 1.

In the second group, 20 femoral catheters were inserted altogether, which means that six patients had catheters in both sides. Femoral cannulation was necessary because of the impossibility of using other veins. In seven patients, USG examination disclosed jugular stenoses (probably after previous cannulation); in three patients, despite a normal USG image, attempts of jugular vein cannulation were unsuccessful; and in one patient jugular catheterization was impossible due to neck oedema complicating a prestenal fistula. The remaining three patients did not give their permission for cannulation of the jugular veins. Our practice is to allow patients with an indwelling femoral catheter to be treated on an outpatients basis.

The reasons for long-term maintenance of the femoral catheter were problems with gaining permanent vascular access due to the extended period of maturation of the fistula (in seven patients), infectious and thrombotic complications of PTFE grafts (in two patients), several unsuccessful attempts of fistula creation (four patients), and the impossibility of puncturing an oedematous unconventional presternal fistula in one case.

All the catheters were removed when they were no longer needed except for six cases in group 2: two due to thrombosis, three to oedema of the leg, and one to infection.

Bacteraemia in one patient and local exit-site infection in three patients were successfully treated and did not require the removal of the catheter. We used polyurethane double-lumen catheters (Gambro), 20 and 24 cm long, inserted at bedside using the Seldinger technique.

Catheter lumen patency was maintained by the infusion of 1 ml of heparinized solution (5000 U/ml) into each port immediately after placement and after each haemodialysis treatment. Anticoagulation during dialysis sessions was achieved with standard heparinization (100 IU per kg body weight).

Magnetic resonance imaging (MRI) was used as the method of examination because it allows diagnosis of stenotic changes in the vessels from the minor pelvis comparable to conventional venography [7,8].
Discussion

Our study reveals that patients who have the femoral vein catheterized for more than 4 weeks are at risk of femoral and external iliac vein stenosis. Data on long-term complications, especially post-catheterization femoral stenoses, are very limited due to the guidelines limiting femoral vein catheter maintenance to 3–5 days [9–11]. On the other hand, the increasing number of the so-called ‘difficult patients’ (diabetic, obese and elderly) and the difficulties in creating permanent vascular access force the long-term maintenance of catheters in the femoral vein as a temporary vascular access. Consequently, there are reports of maintaining femoral catheters for even up to 183 days [12–14].

The rate of stenosis observed in our patients after long-term femoral catheterization (29%) seems to be similar to that reported for the subclavian vein (20–50%) and slightly higher than for the internal jugular vein (10%) [4–6].

In our patients, only polyurethane catheters were inserted. Therefore, we cannot compare the results obtained with the rate of complications involving silicone femoral catheters [12]. However, in published comparative observations, no advantage of silicone over polyurethane catheters in terms of complications have been discerned [15].

The appearance of post-catheterization femoral and iliac vein stenoses does not always have negative effects on the patient. In our study the complication occurred in four patients. In one of these (who had one-sided changes) a successful renal transplantation was performed. The long period of femoral catheter maintenance allowed us to fashion permanent vascular access in the other three patients.

We have to be aware of the fact that prolonging the duration of vein catheterization for more than 4 weeks may cause vein stenoses in the iliac vein system and be a burden to femoral bridge graft creation and the performance of renal transplantation.

We must emphasize the fact that our patients had femoral vein catheters maintained for over a fortnight only due to the lack of other access to the circulation.

Conclusion

Our study indicates that when a catheter is maintained in the femoral vein for more than 4 weeks a significant risk of stenosis should be taken into account. The decision to prolong femoral vein catheterization should be made only if there are no alternative possibilities of performing haemodialysis.

Conflict of interest statement. We have no involvements that might raise the question of bias in the work reported or in the conclusions, implications or opinions stated.
References


Received for publication: 31.3.03
Accepted in revised form: 7.1.04