Mechanism of Hemodialysis-Associated Subclavian Vein Stenosis

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Dear Sir,

Erben et al. [1] described first the routine use of subclavian vein cannulation for hemodialysis (HD). More recently, it was popularized by Uldall et al. [2] in conjunction with the development of a 'single-needle' subclavian HD catheter. Nowadays, it is being widely used all over the world. Its advantages are considered to be rapid insertion, no impairment of the patients mobility, and no damage to blood vessels that could result in arteriove-nous fistulas [3]. Minor complications such as local pain or hemorrhage, arterial puncture, and catheter thrombosis cause usually no problems. Nevertheless, several serious complications such as sepsis, pneumothorax, life-threatening events, and thrombosis-stenosis of the subclavian vein, specially after the creation of an arteriove-nous fistula on the ipsilateral side of the catheter, have been reported [4–6]. Little is known about the causes of this subclavian vein thrombosis-stenosis, although several authors have speculated on the role of prior subclavian vein cannulation. Also incidence and natural history of subclavian thrombosis-stenosis following the use of subclavian dialysis catheters are still unknown. Therefore, we have performed subclavian venograms in a group of patients who had a subclavian catheter inserted for HD after catheter removal.

Methods

Single-lumen catheters of polyurethane (Med-West, Salt Lake City, Utah, USA) were placed atraumatically using the technique of Uldall et al. [2]. Following each dialysis session, the catheter was flushed with 2.5 cm³ of heparin (1,000 IU/cm³). The catheter was used only for HD purposes.

From February to May 1988, 15 patients (8 males and 7 females) suffering from renal failure requiring HD were dialyzed using these catheters, and after removal of the catheter, a peripheral venogram

was performed. Eleven patients suffered from chronic and 4 from acute renal failure. The mean age of the patients was 57 years (range 25–75 years). The mean duration of catheter placement was 7 days (range 6–77 days).

The peripheral venogram was performed 10–148 days (mean 67 days) after removal of the catheter and prior to fistula creation. A 21-gauge needle was placed in a peripheral vein of the ipsilateral side in which a subclavian catheter had previously been placed. As contrast medium

20–25 cm³ of Omnitrast-350 (iohexol) was injected, and serial films of the subclavian vein region were then taken. All patients were asymptomatic at the time of the study.

Results

Fifteen subclavian venograms were performed in 15 patients. All phlebographies were normal. None of these patients developed clinical problems during the follow-up period (mean 7 months). One patient, not included in this study, developed a symptomatic (arm edema and collateral circulation) subclavian vein thrombosis 5 months after removal of the subclavian catheter with a functioning ipsilateral arteriovenous fistula.

Discussion

Thrombosis-stenosis of a subclavian vein is a potentially serious complication of the subclavian route for HD and nowadays has become a frequent disturbance due to the wide and prolonged use of subclavian dialysis catheters [4–7]. This is particularly evident after the arteriovenous fistula has been created on the same side as previous subclavian catheterization was performed and often requires removal of the arteriovenous fistula and complicates future fistula replacement [6, 7].

The mechanism causing this subclavian thrombosis-stenosis is unknown, although several factors have been

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related. Mural thrombosis occurring due to venous wall trauma, fibrosis caused by constant movement of the catheter in and out of the subclavian vein during HD, leaking of the plasticizers from the catheter at the side of contact with the vessel wall, and, finally, the role of venous hyperpressure induced by the arteriovenous fistula are some of the reported factors [5, 7]. Thrombosis-stenosis of a subclavian vein may remain clinically silent, and in most instances detection resulted from a phlebography done because of elevated venous pressure during HD or arm edema, and collateral circulation develops only after vascular access is attempted on the ipsilateral side. Moreover, the clinical signs disappeared, as the arteriovenous fistula was suppressed, underlining the role of the venous hyperpressure for the development of symptomatic subclavian vein thrombosis-stenosis. This means that a lot of subclavian vein thromboses may remain clinically silent and that without prospective systematic studies by venograms before and after the creation of the vascular access this complication could be underevaluated. In this way, the study of van der Merwe et al. [8] and our results demonstrate a low incidence (15 and 0%, respectively) of silent thrombosis-stenosis of the subclavian vein after catheterization for HD. Moreover, van der Merwe et al. [8] demonstrated the rapid resolution and in 3 patients with minor to moderate narrowing lesions and in 1 of the 3 with gross lesions 1 month after catheter removal and without fistula creation. Both studies support the hypothesis that in the development of thrombosis-stenosis of the subclavian vein after catheterization hyperpressure and turbulence induced by the fistula are essential factors insertion. In the future, if an arteriovenous fistula is to be placed on the ipsilateral side of the catheter, an atraumatic examination (Doppler) showing the patency of the subclavian vein system should be obtained prior to creation of the angioaccess. If any lesion is evident (thrombosis), the fistula may be placed on the other side or its creation delayed until any venogram lesion is present.

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Erratum

In the article by Podjarny et al.
entitled ‘Captopril

but Not list of authors should read as follows: E. Podjarny

M. Rathaus

Diltiazem

Favorably Affects the Course of Early Chronic Renal Joëlle Bernheim

J. Shapira

N. Kariv

A. Pomeranz

S. Zadok

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the Jacques Bernheim.