Factors contributing to hypotension during hemodialysis

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Accepted 7 August 1996

Key words: hemodialysis hypotension, chronic hemodialysis, diabetic nephropathy, midodrine

Abstract

Background

The characteristics of patients receiving chronic hemodialysis in the United States has continuously changed over the past three decades. Today the patients are older, and the incidence of diabetic nephropathy has markedly increased. Hypotension during hemodialysis is the most common and bothersome complication of chronic hemodialysis. The demographics of those patients who experience hypotension during dialysis has not been previously identified.

Methods

The change in systolic pressure during hemodialysis was reviewed for ten consecutive hemodialysis treatments in 134 patients in a single hospital-based unit. For the past four years, those patients who have had symptoms during their hypotensive episodes associated with hemodialysis have been under continuous therapy with midodrine.

Results

In the present study, the overall incidence of patients experiencing decreases of, at least, 40 mmHg systolic pressure, in over 50% of their treatments, is 63%. The incidence of patients having symptoms from hypotension during hemodialysis is 25%. Analysis of the dialysis population shows that the age of the patients is a primary factor leading to hypotension. Diabetic nephropathy is identified as a second risk factor for hypotension. However, the incidence in the asymptomatic group versus the symptomatic group was not statistically significant. In the group of patients (25%) who have hypotension during hemodialysis with clinical symptoms, all had hypertension requiring therapy prior to initiating hemodialysis. Hypertension may be a predisposing factor to the development of hypotension. Females tended to have more hypotension during dialysis than males.

Conclusions

As a result of the increasing age of patients receiving hemodialysis and the increasing incidence of diabetic nephropathy, hypotension will become an even greater problem in the future.

Introduction

The pattern of blood pressures in patients receiving chronic dialysis has changed considerably over the past 25 years. In the decade of the 1970s, textbooks [1, 2] on chronic dialysis did not mention hypotension as a complication or problem during treatment. In the 1990s, hypotension has become the leading complication of the hemodialysis treatment, with an incidence quoted between 10% and 30% of treatments [3, 4]. Not
only is the number of patients receiving dialysis in the United States continuing to increase, but also the age of the patients and the incidence of diabetic nephropathy are increasing [5]. As a result of the changes in the type of patient (older and more diabetics), the incidence of hypotension may also be changing.

No study, as of yet, has identified the demographics of those patients in a chronic hemodialysis unit who get hypotension during treatments. To evaluate this, the blood pressures of all of the patients receiving hemodialysis in a single unit were reviewed over a two-day period. Evaluations encompassed each patient's previous ten hemodialysis treatments. The etiology of each patient's renal failure, the length of time each patient has received dialysis, and the gender of the patients were also analyzed. In those patients with symptomatic hypotension, a history of hypertension requiring therapy at the initiation of chronic hemodialysis was included.

Midodrine has been available, on an investigational basis, to treat patients who develop symptomatic hypotension associated with hemodialysis in this dialysis unit for the past four years. Midodrine is a selective alpha-1 adrenergic agonist that is being used in the United States to treat postural hypotension on an investigational basis [6, 7]. It is rapidly and completely absorbed by the gastrointestinal tract and has been shown to be effective in the treatment of hypotension during hemodialysis [8, 9]. Midodrine has been shown to be well tolerated by patients with chronic renal failure, without any significant side effects [8]. Midodrine was given immediately prior to the hemodialysis treatment, and a second dose was given mid-dialysis, for patients who were hypotensive at the end of their treatment.

**Patients and Methods**

On January 14 and January 15, 1995, the records of the past ten consecutive dialysis treatments, for all of the 134 patients receiving chronic hemodialysis in a single teaching-hospital based unit, were reviewed. The pre-dialysis systolic pressure was used as a reference to measure the fall in blood pressure during each treatment. If the systolic pressure decreased by, at least, 40 mmHg at any time during a hemodialysis treatment, that treatment was considered unstable. If a patient had unstable blood pressures during 50% or more of the treatments, that patient was assigned to the unstable group.

Prior to the review, 34 patients were already assigned to the unstable group. This group of patients is known to have symptomatic hypotension during hemodialysis. They had either a decrease of, at least, 40 mmHg pressure or a pre-dialysis systolic pressure less than 120 mmHg that was associated with clinical symptoms of hypotension. In those patients who began dialysis with systolic blood pressures less than 120 mmHg, they began to experience symptoms of hypotension when the systolic pressure decreased below 100 mmHg, and when the systolic blood pressure decreased below 90 mmHg, they were universally symptomatic. These symptoms varied from the mild ones, such as feeling weak, light-headedness, dizziness, or yawning, to shortness of breath, muscle cramps, abdominal cramps, nausea, vomiting, and loss of consciousness. The medical history of the symptomatic hypotensive patients was reviewed for hypertension and antihypertensive therapy at the time dialysis was initiated.

When patients became symptomatic from hypotension, several measures were employed to try to combat the hypotension. The first was to discontinue all antihypertensive therapy, which also included oral and long-acting nitrates. The dry weight of the patients was cautiously increased in order to try to lessen the hypotension. The sodium in the dialysis bath was increased to 144 mEq/L. When all of the above failed to prevent symptomatic hypotension, midodrine therapy was offered to the patients.

The ages of the patients and the etiology of renal failure were analyzed in the stable and unstable groups to determine if these were factors for the development of hypotension during hemodialysis. The length of time on dialysis and the gender of the patients were also analyzed.

The blood pressures were taken by auscultation and electronically with Dinamap machines in equal proportions. All patients were dialyzed with Baxter 550 volumetric machines, using bicarbonate baths and a sodium setting between 135 mEq/L and 144 mEq/L. One hundred and twenty-eight patients were on reuse, with a reuse frequency of eleven treatments. Six patients received conventional dialysis without reuse. Hypotension during hemodialysis is defined as a drop of 40 mmHg or more of systolic blood pressure, as compared to the pre-dialysis systolic blood pressure, at any time during a single hemodialysis treatment. A small percentage of patients had low pressures prior to hemodialysis (systolic 100 to 120 mmHg). These patients usually became symptomatic with less than a