

## **Bernard Charra, MD**

Synopsis from the article: [Charra B, Bergstrom J, Scribner BH. Blood pressure control in dialysis patients: The importance of the lag phenomenon. \*American Journal of Kidney Diseases\* 1998;32:720-4.](#)

Sodium is the predominant cation of the extracellular volume (ECV). ECV is directly proportional to the amount of sodium present in the body. The sodium content of the body is related to the dietary salt intake and the urinary excretion. Chronic renal failure leads to sodium accumulation, ECV excess, and hypertension (HTN). In the 1940's, Kempner showed in essential HTN patients that reducing the salt intake allows for blood pressure (BP) normalization with a delay of some weeks. In 1988, Freis, using diuretics to reduce ECV, noticed that the BP response lagged behind by a few weeks. In 1960, Scribner cured the malignant HTN of Clyde Shields, the first maintenance hemodialysis patient, by combining aggressive ultrafiltration with a reduced salt intake. The BP decrease occurred some weeks after a reduction of the post-dialysis weight. This observation was amply confirmed during the following decade by Robert Hegström in Seattle, Christina Comty in London and Gerald Thomson in New York. All these investigators observed that the BP response to ECV reduction was delayed by some weeks.

Analyzing 712 patients' weight and BP decrease at dialysis initiation, the present study shows that the ECV nadir is achieved within the first month. At that time, BP has only started to decrease but it eventually reaches a plateau only after 6-12 months.

Several explanations for this time lag are offered. Autoregulation of vascular resistances including functional and structural (remodeling) changes is probably involved. Other potential explanations include the reduced formation or inhibition of vasoactive substances such as asymmetric dimethylarginine or Na-K-ATPase .

Whatever the explanation, the lag time has a great practical importance for healthcare providers and patients. These individuals should be aware of the phenomenon and not become discouraged if it takes weeks or months of dry weight policy to achieve a lower blood pressure (when antihypertensive medications are not administered at the same time). Should we wish to reduce the high cardiovascular morbidity and mortality of dialysis patients, achieving a normal ECV (dry weight) and BP is a major step that is worth all the efforts, including being convinced of the effectiveness of the dry weight method and knowing that it will take some time to obtain favorable results.

### **Commentary by Todd S. Ing, MD**

Dr. Charra and his colleagues described the lag phenomenon well. The phenomenon maintains that: After the blood pressure of a hypertensive hemodialysis patient has started to fall by some extent after removal of the body's excessive fluid by means of a combination of ultrafiltration and sodium intake restriction (i.e., after dry weight has been achieved), the remaining high blood pressure will often, by itself, decrease further (although not necessarily to normal levels) over several weeks or months if the patient's dry weight is continuously maintained. When treating hypertensive dialysis patients, physicians in the US generally strive to adjust frequently the dosage of antihypertensive medications in accordance with current blood pressure levels. However, it is advantageous to be aware of the existence of this important phenomenon.

### **References:**

1. Comty C, Rottka H, Shaldon S. Blood pressure control in patients with end stage renal failure treated by intermittent haemodialysis. *Proc Eur Dial Transplant Assoc* 1964;1:209-20.
2. Khosla UM, Johnson RJ. Hypertension in the hemodialysis patient and the "lag phenomenon": Insights into pathophysiology and clinical management. *Am J Kidney Dis* 2004;43:739-51.