VENTRICULAR ARRHYTHMIAS IN HEMODIALYSIS PATIENTS:
A STUDY OF INCIDENCE AND CONTRIBUTORY FACTORS

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ABSTRACT

One hundred patients undergoing maintenance hemodialysis for chronic renal failure were evaluated by Holter ECG monitoring for a 72-hour period from the day of hemodialysis therapy. Eighteen patients (the frequent group) who had more than 700 premature ventricular contractions (PVCs) per day were found among these 100 patients. In those eighteen, the PVCs were recorded frequently during and for 4 hours after hemodialysis. The values of the serum calcium concentration times those of phosphorus, which are thought to be an index of parathyroid function, were significantly higher in the frequent group than in patients without PVCs (the no arrhythmia group) or in those with fewer PVCs (less than 700 beats per day; sporadic group). Also, in the frequent group, the percent fractional shortening of the left ventricle, as measured by 2-dimensional echocardiography, was significantly lower than those in the no arrhythmia and sporadic groups. From these results, we conclude that the pathogenesis of the PVCs in chronic renal failure resulted partially from impaired cardiac performance and accelerated parathyroid function.

INTRODUCTION

Owing to advances in hemodialysis techniques and their application, the number of long-term hemodialysis patients has been increasing markedly in Japan. As a result, cases of secondary hyperparathyroidism have also increased in frequency. It has been recognized that hyperparathyroidism secondary to chronic renal disease may be exacerbated by long-term hemodialysis. Parathyroid hormone (PTH) is thought to be one of the uremic toxins that causes anemia, uremic osteitis fibrosa, and/or peripheral neuropathy. Recently, PTH has been shown to cause deterioration of cardiac function, inhibition of the vascular response to norepinephrine, and so-called uremic cardiomyopathy. On the other hand, it is now well documented that cardiac arrhythmia has been encountered frequently in uremic patients who have undergone regular hemodialysis. There remains controversial, however, regarding the factors that contribute to cardiac arrhythmias. Several likely factors have been suggested, including rapid fall of serum potassium during hemodialysis, abnormal plasma catecholamine levels, uremic cardiomyopathy, and the use of digitalis, the mechanisms of these arrhythmias.
has not been defined with any certainty. We have recently encountered a very interesting case whose ventricular arrhythmia was markedly diminished after parathyroidectomy, suggesting that PTH may have caused the ventricular arrhythmia. The experience of this case led us to study the correlations between maintenance hemodialysis and the prevalence of ventricular arrhythmias. We also evaluated factors that may contribute to the development of such arrhythmia.

CASE REPORT

A 43 year old man had been receiving regular hemodialysis therapy for 12 years. He had experienced pulse deficit during hemodialysis therapy for 2 years, and had suffered from ankle and knee joint pain over the same period. Clinical findings such as a Rugger jersey appearance and a salt-and-pepper appearance on bone X-ray films, a high plasma concentration of c-terminal parathyroid hormone (c-PTH; 25.6 ng/ml), and enlarged parathyroid glands led us to diagnose secondary hyperparathyroidism. After the admission, 72 hours of continuous Holter monitoring was performed and the ECG showed frequent mono-morphic PVCs (711 beats per day). However, 72-hour Holter monitoring revealed only 1 PVC a day on the 7th day after parathyroidectomy (Fig. 1).

Fig. 1. A 43 year old man with secondary to hyperparathyroidism. The upper part of the left column shows the amount of PVC on hemodialysis day, and the lower part, the amount of PVC on non-hemodialysis day. The number of PVCs increased during and for 4 hours after hemodialysis. 72 hours of Holter monitoring showed only 1 PVC a day on the 7th day after parathyroidectomy, as shown in the middle column. The concentration of the c-PTH was also significantly diminished after parathyroidectomy.