

COMPARISON OF MOTOR NERVE CONDUCTION VELOCITY AND VIBRATORY PERCEPTION AS LONG TERM MARKERS OF URAEMIC POLYNEUROPATHY

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Summary

Long term trends of motor nerve conduction velocity (MNCV) and vibratory perception (VP) were compared in 141 patients on chronic haemodialysis. Overall results are better in females and deteriorate with increasing age. Whereas all 94 trends found for VP show an improvement, 10 of 11 MNCV-trends demonstrate an impairment in the same patients. The positive VP-trends in half of the patients at onset of the investigation, independent of the onset of dialysis treatment, hints at a learning effect for VP. These results raise doubts about the validity of both methods.

Introduction

Uraemic polyneuropathy has been one of the most devastating complications of the uraemic syndrome in the early days of chronic dialysis treatment [1]. In spite of improved treatment quality neurological function impairment might still be observed in a few patients. Measurements of peripheral nerve function are supposed to provide early information about insufficient dialysis treatment resulting in cumulation of uraemic toxins which in turn cause peripheral nerve dysfunction. Most commonly the MNCV of the nervus peroneus profundus and/or the VP of the lower limb are used for routine study of peripheral nerve function [1-3].

Patients and methods

We routinely performed both measurements simultaneously every four to six weeks in all our patients on chronic intermittent haemodialysis treatment. All patients with at least 10 measurements are included in this report. No other exclusion criteria were used. MNCV was determined in both lower limbs using an Elektromyograph DISA 14 A 11. VP was investigated at three standard points

on each foot and expressed as VP-threshold (scale units of vibratory energy), which is inversely related to vibratory perception itself [3]. The results of each side were averaged and reported separately. A trend was only considered to be true if it occurred in both legs simultaneously. In addition to the statistical calculation of trends we examined correlations between age, sex, total time of dialysis and both neurological parameters. 141 patients are included in this survey (40 female, mean age 39.9 ± 13.4 years, 101 male, mean age 40.7 ± 11.2 years). The mean total duration of dialysis treatment since its initiation was 72.8 ± 36.7 months. The shortest follow-up time in respect of neurological controls was 60 weeks, the longest 444 weeks.

Results

MNCV and VP both are worse in dialysis patients as compared to healthy controls and are significantly different between male and female patients ($p < 0.001$). They also correlate significantly to age ($p < 0.005$) (Table I, Figure 1).

TABLE I. Correlations of sex, age, total time on dialysis with MNCV and VP

	MNCV	VP
Sex	43.4	17.0
	39.9	20.5
Age	s	s
Total time of dialysis	ns	ns
MNCV	—	s

s: significant correlation or difference ($p < 0.001$)
 ns: not significant

Corrected for the influence of age there is no significant correlation between MNCV, VP and the total duration of dialysis treatment. There is a highly significant correlation between MNCV and VP indicating that patients with good mean MNCV also have good mean VP. In 130 patients no significant trend could be identified for MNCV, neither for the whole observation period nor for the time intervals. Nine patients had a negative trend for the whole follow-up, one patient for a time interval. In one patient a positive trend was apparent. We observed VP trends in 94 patients, either for the whole observation period ($n=69$) or for intervals ($n=67$). All trends were positive, indicating an improvement. The initiation of this study however was not necessarily identical with

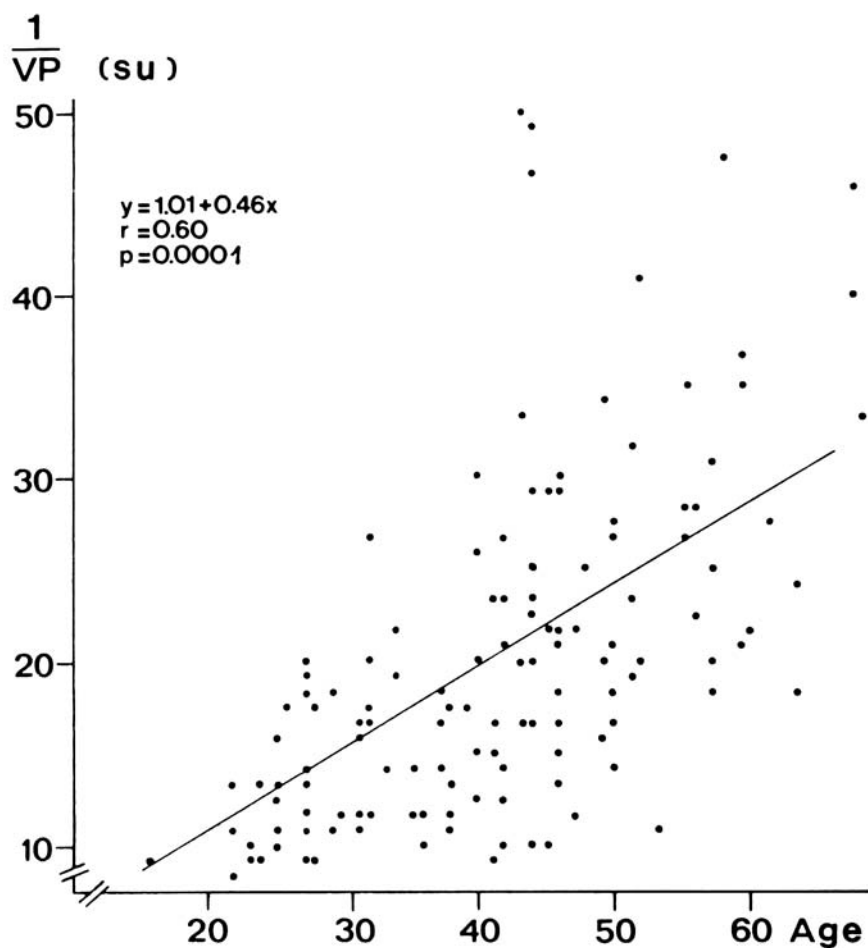


Figure 1. Dependence of the VP-threshold ($=1/VP$ in scale-units of the vibration energy) on age

the start of dialysis treatment since 34 patients had already been on dialysis long before this investigation started (43.6 ± 29.4 months). Therefore it is interesting to note that in 29 of these patients a significant amelioration of VP occurred during the first 15 months of the study. The same development could be observed in 33 patients in whom the beginning of the study and the initiation of dialysis treatment were identical. A similar distribution was seen for the 69 patients with an overall trend: In 33 the trend was coincident with onset of VP-measurements, in 36 of them with onset of dialysis treatment. In comparison of both modes of neurological control parameters it becomes evident that in just one

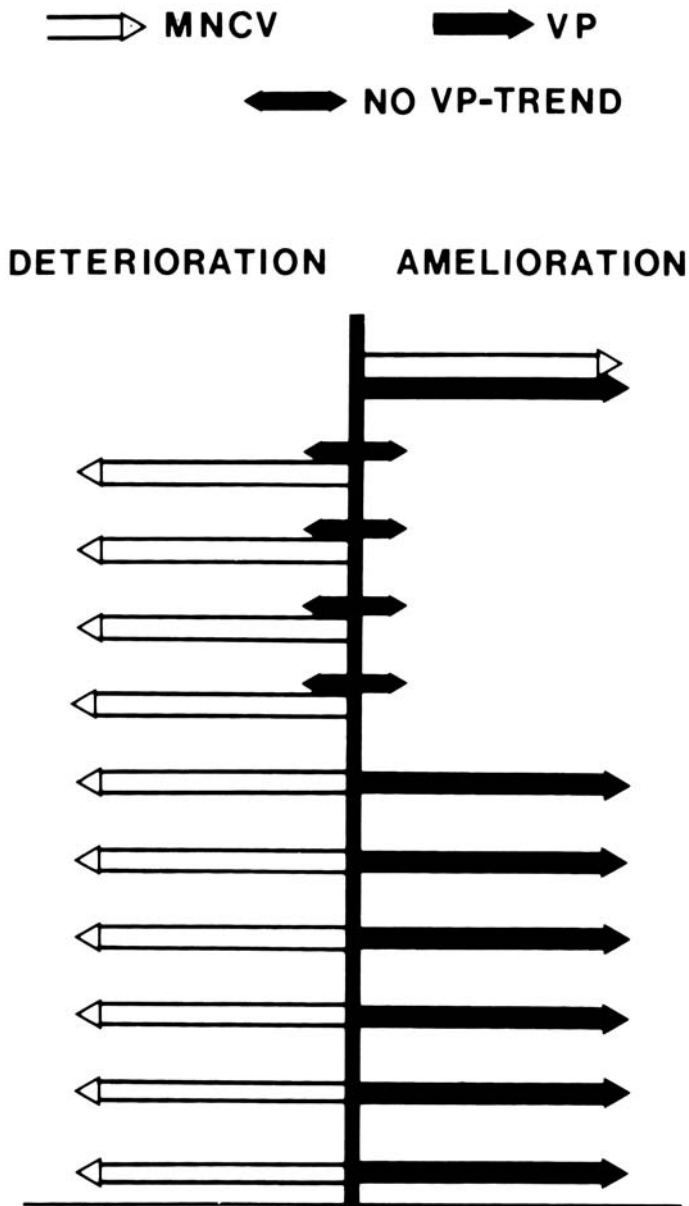


Figure 2. Differences of trends for MNCV and VP in those 11 patients demonstrating a MNCV-trend

case MNCV and VP improved simultaneously. However the 10 patients with a deteriorating MNCV at the same time had an improving or unchanged VP (Figure 2,3).

LEARNING EFFECT FOR VP

(EXAMPLES)

Trends: initial

--- whole period

1st Dialysis

1st VP-Measurement

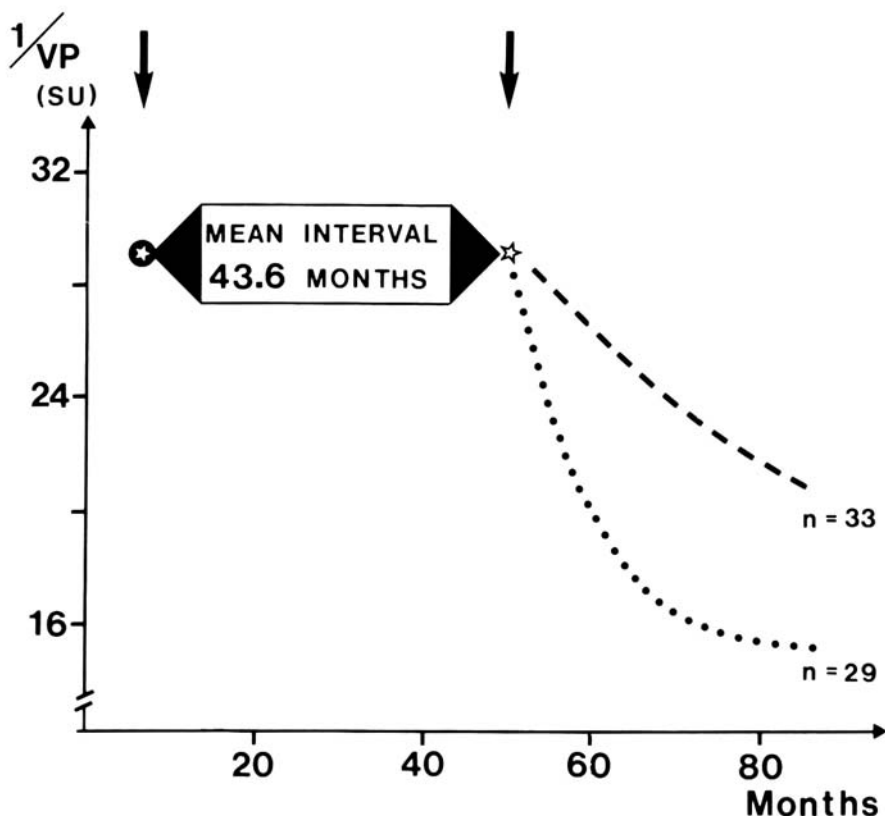


Figure 3. Exemplary VP-improvements at onset of VP-measurements independant of onset of dialysis in half of the patients with partial or overall trend

Discussion

In the present investigation we studied long term trends of MNCV and VP in chronically haemodialysed patients. Correlations between the outcome of the individual data and age as well as sex have been described before, emphasizing

that these influences have to be accounted for in group analysis [4,5]. Our results indicate that VP will become better in most of the dialysis patients. This could be ascribed to detoxification secondary to the initiation of dialysis treatment in those patients in whom the initiation of dialysis and the beginning of the neurological measurements overlapped [3,4]. However since the same improvement of VP could be observed in patients having been on dialysis long before the beginning of this investigation we tend to interpret this improvement as a learning effect [6,7]. In only one patient a concurrent development of MNCV and VP, in the sense of an improvement of both parameters, was documented. The observation that in 10 patients at the time when MNCV was deteriorating an improvement of VP occurred leads to the statement that VP is less suitable for indicating peripheral polyneuropathy than MNCV: as a routine long term marker this might be due to the fact that in contrast to MNCV-measurements during VP determinations the investigator as well as the patient might influence the outcome of the results considerably thus complicating their interpretation [6,7].

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