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A study on visual evoked responses in children with chronic renal failure

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Abstract

Aims of the study. - Nervous involvement is frequent in patients with renal failure. Early recognition of the condition by electrophysiological tests may provide means for protective measures before irreversible damage of nervous system (NS) structures takes place. This study has two objectives: (1) examining whether pattern-reversal visual evoked potential (PR-VEP) studies may provide information relating to possible subclinical NS involvement in pediatric patients with chronic renal failure (CRF) and (2) looking for a possible relationship between serum parathormone (PTH) and creatinine levels and PR-VEP parameters.

Methods. - PR-VEP recordings at low spatial frequencies were performed and peak-to-peak amplitudes and latencies of the P100 component were measured in 19 neurologically asymptomatic children with CRF, 15 of whom were on continuous ambulatory peritoneal dialysis (CAPD) and four on hemodialysis (HD). A similar procedure was applied to 29 healthy, age- and sex-matched, subjects. Patients were sub-grouped according to the serum PTH and creatinine levels. Student's-t and one-way ANOVA tests were used for comparisons within patient and control groups and sub-groups relating to serum PTH and creatinine levels.

Results. - We did not demonstrate any statistically significant differences in PR-VEP parameters in patients vs. controls. PR-VEP amplitudes were higher in patients with low serum creatinine levels as compared to group with high creatinine values and to controls. No other relationship was found between PR-VEP parameters and serum PTH and creatinine levels in this pediatric population.

Conclusion. - Young patients with CRF and under dialysis do not necessarily show pathologic alterations in PR-VEPs when they are neurologically intact. This fact suggests that either PR-VEPs are not sensitive enough to detect clinically silent NS involvements in such patients, or it could be related to positive effects of the currently improving standards in the management of dialysis and supportive nutrition. Additional factors such as the age of the patient during examination, the latency between dialysis and visual evoked potential (VEP) assessment, or the selected check size may have some impact on the results and justify further studies.

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MOTS CLÉS

Potentiels évoqués visuels ;
Insuffisance rénale chronique ;
Enfant ;
Hémodialyse ;
Dialyse péritonéale continue ambulatoire

Résumé

Objectifs. - L'atteinte du système nerveux (SN) est assez fréquente chez les patients présentant une insuffisance rénale. La détection précoce d'un tableau neurologique au moyen d'explorations fonctionnelles peut fournir une information précieuse pour la mise en place de mesures préventives afin de réduire les risques d'atteinte irréversible du SN. Cette étude a pour but de répondre à la question de l'utilité des potentiels évoqués (PE) visuels par stimulation structurée au moyen de damiers (PEV-D) dans la détection d'anomalies infracliniques du SN chez les patients présentant une insuffisance rénale chronique (IRC) et d'évaluer l'effet des taux sanguins de parathormone (PTH) et de créatinine sur les paramètres neurophysiologiques étudiés.

Méthodes. - Les PEV-D de faible fréquence spatiale ont été enregistrés chez 19 enfants neurologiquement asymptomatiques présentant une IRC (15 en dialyse péritonéale continue ambulatoire ; quatre en hémodialyse) et 29 sujets témoins (appariés en âge et sexe) afin de mesurer le temps de latence et l'amplitude de la positivité majeure (P100). Les patients ont été regroupés sur base des taux de PTH et de créatinine. Les comparaisons entre les patients et sujets témoins puis entre les sous-groupes des patients selon les taux de parathormone et de créatinine ont été testées par l'analyse statistique au moyen du test *t* de Student et d'une ANOVA.

Résultats. - Nous ne démontrons pas de différence significative entre les patients et les sujets témoins concernant les composantes étudiées au niveau des PEV-D. On constate une augmentation de l'amplitude de P100 chez les patients présentant des taux bas de créatinine en comparaison à ceux qui ont des taux élevés et aux sujets témoins. On ne note pas d'autre relation significative entre les valeurs obtenues à l'étude des PEV-D et les taux de PTH et de créatinine chez ces enfants. De même on ne note pas de relation significative entre les valeurs obtenues à l'étude des PEV-D et les taux de PTH et de créatinine.

Conclusions. - Les PEV-D peuvent être normaux chez des enfants dialysés, présentant une IRC sans atteinte neurologique. Cela peut être interprété, soit comme une preuve de l'insuffisance du PEV-D à détecter les atteintes neurologiques infracliniques chez ces patients, soit comme une conséquence de l'amélioration des techniques de dialyse et des supports nutritionnels. D'autres facteurs comme l'âge du patient au moment de l'examen, l'intervalle de temps écoulé entre la dialyse et l'enregistrement des PEV-D ainsi que la fréquence spatiale du stimulus devraient également être pris en compte lors d'études futures.

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Introduction

Neurological alterations such as developmental, intellectual and motor disturbances, are reported to be frequent in patients with renal failure [8,11,17,20]. Younger children are more impaired and profound neurological abnormalities consisting of motor and language delay, microcephaly, hypotonia, dyskinesia, and seizures have been shown, especially in children who develop chronic renal failure (CRF) within the first year of life [8,17,20]. In addition to neurological dysfunctions, various authors have emphasized the presence of electrophysiological abnormalities in patients with end-stage renal disease and in ones who received dialysis therapy [2-4,9-15,19].

Evoked potentials (EP) (visual, auditory, and somatosensory) are diagnostic tests that provide objective information about the functional integrity of the neural structures along the corresponding sensory pathways. EP abnormalities identify dys-

function in specific sensory pathways and suggest the location of a responsible lesion. EPs are most useful when they detect clinically silent abnormalities, and, as such, may be viewed as an extension of the neurological examination. These were studied in large groups of patients with a wide variety of neurological diseases and find their greatest clinical use in diagnosis of demyelinating, brain-stem or sensory organ disease, as also, in multi-systemic diseases. Uremic patients are reported to exhibit prolonged latencies in components of auditory [12,18], somatosensory [11,14] and visual EP to both flash [9,15,19] and pattern-reversal [2-4,13,18,19] stimulation. Such abnormalities were also found in patients maintained on chronic hemodialysis (HD) [2,9,13,14,19]. Variable results indicating either a direct relationship of serum PTH and creatinine levels on the prolongation of latency in visual evoked potentials (VEPs) [9,19] or no relationship among those parameters [1-4,13,14] have been reported. Due to the possibility that, in pa-

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