L-carnitine – an efficient complementary medical therapy within the multimodal treatment concept of the «Attention Deficit Hyperactivity Disorder» (ADHD)

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Introduction:

The **«Attention Deficit Hyperactivity Disorder» (ADHD)** constitutes the most frequently occurring psychiatric disorder in childhood and adolescence. It is characterised by the symptom triad of hyperactivity, impulsivity and attention deficit disorder. Defective social interaction and integration, disorders in emotionality as well as academic and familial problems often constitute considerable attendant secondary symptoms.

At the **«Centre of Developmental Advancement and Paediatric Neurorehabilitation»**, a holistic multimodal treatment concept is applied in children diagnosed with ADHD. Within an **«integrative medicine»** this treatment concept especially considers complementary medical measures in addition to educational/pedagogic and conventional medical treatments.

Sometimes the adoption of complementary medical measures makes it possible to abstain from a medical therapy with Methylphenidate (MPH) altogether or, for instance, to optimise the effect of the medical therapy.

Against this background **the treatment of ADHD with L-carnitine** constitutes an efficient, already scientifically evaluated therapy. The aim of our research was to document the effect of L-carnitine in an «open label» study in children diagnosed with ADHD.

Patients:

Total Patients:	14
Boys:	10
Girls:	4
Age:	4–10
Pure ADHD:	4
ADHD plus «aggressive» behaviour:	4
ADHD plus partial disturbances of performance:	3
ADHD plus aggressive behaviour plus Partial disturbances of performance:	3

Additional therapies:

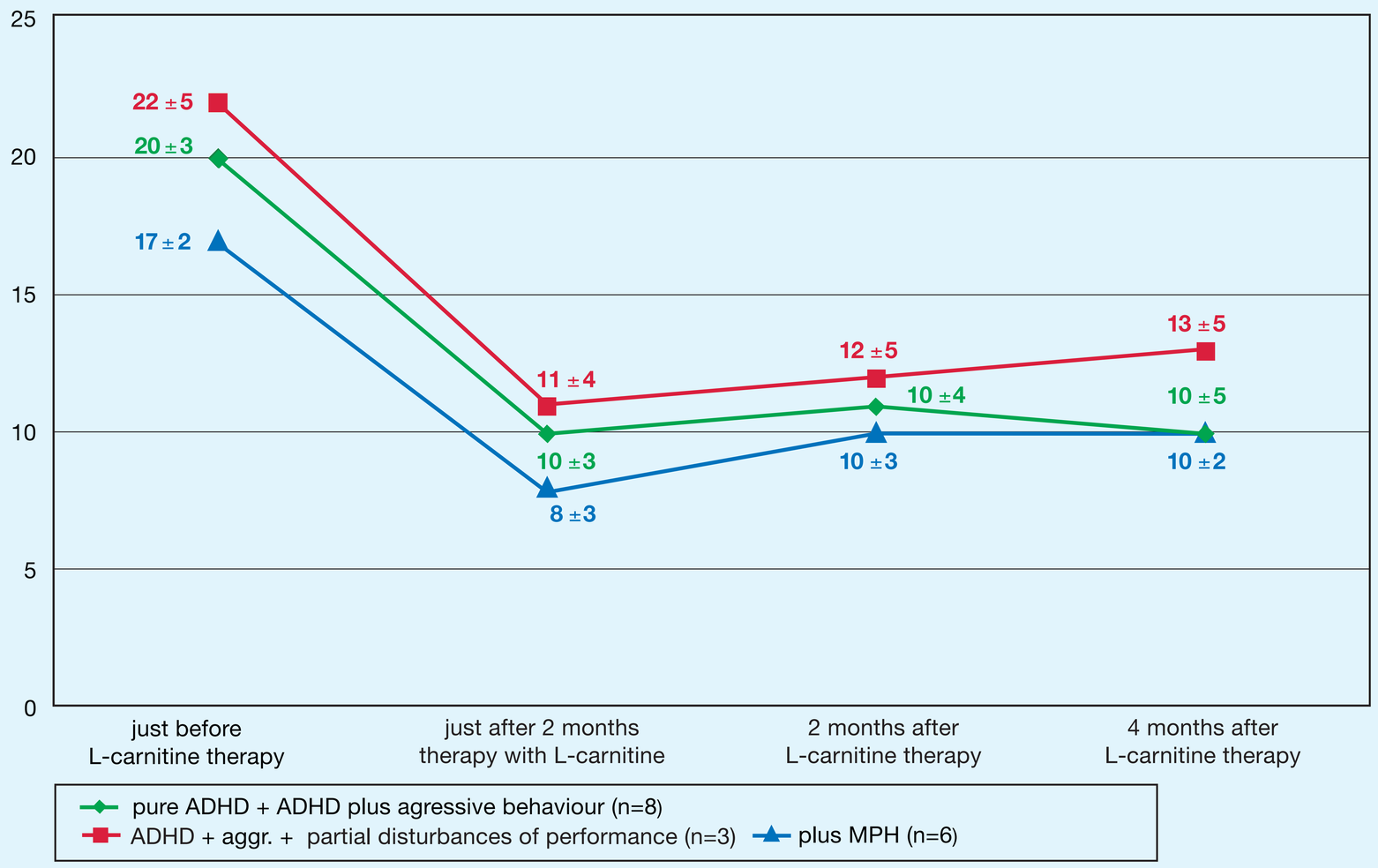
Occupational therapy:	6
Behavioural therapy (individual setting):	5
Behavioural therapy (group setting):	2
Homoeopathy:	5
Medicinal therapy with MPH:	6

Results:

In all patients there was **a significant improvement ($p<0.01$) in symptoms of hyperactivity, attention and concentration** (there was a decrease in the score of the questionnaires of 30% at least). No undesirable effects were observed. None of the patients dropped out early. **In 6 patients (without MPH therapy), the positive behaviour changes last to this day.** In 2 ADHD patients with aggressive symptoms and a partial disturbance of performance, ADHD symptoms slowly increased again after terminating the 2 months treatment with L-carnitine. Until now it has, however, not been necessary to take additional measures. The 6 patients with «dissatisfactory» MPH therapy (only partial improvement of ADHD symptoms and undesirable effects such as, for instance, a decrease in appetite and problems with falling asleep) showed an additional improvement in primary ADHD symptoms and a reduction of the undesirable symptoms which had almost led to the abruption of the MPH therapy. **In 4 out of 7 children diagnosed with both ADHD and aggressive symptoms, these symptoms improved significantly.**

Results of the Conners questionnaires for the evaluation of hyperactivity

(values > 14 pathological)



Conclusion:

In children diagnosed with ADHD, **L-carnitine** improves hyperactivity and the deficit in concentration as well as comorbid aggressiveness.

In children diagnosed with **ADHD and already installed MPH therapy** the effect of this therapy can be optimised through L-carnitine.

The therapy with L-carnitine is safe and should be considered within the multimodal treatment concept in ADHD patients.

Van Oudheusden's hypothesis seems to be confirmed. In order to be able to explain the exact mechanism of action of L-carnitine in ADHD additional studies are required.

Background:

As cause of ADHD **a disorder of the fatty acid and phospholipid metabolism** is postulated amongst others. (1)

Docosahexaenoic acid, a fatty acid which plays an important role in the maturation and functioning of the brain, is significantly decreased in plasma of ADHD patients. (2)

The role of L-carnitine in metabolism has been researched only partially until now. Next to its important function in the mitochondrion's metabolism (fatty acid oxidation, pyruvate oxidation) **L-carnitine influences microcirculation, membrane reparation mechanisms (reacylation of phospholipids) as well as mitochondrial synthesis of docosahexaenoic acid.** (3, 4)

In a randomised, double-blind, placebo-controlled double-crossover study, Van Oudheusden et al. showed that treatment with L-carnitine in ADHD patients came along with a significant improvement in symptoms like attention, aggressiveness and delinquency, amongst others. They hypothesise that L-carnitine stimulates the synthesis of acetylcholine as well as thesynthesis of docosahexaenoic acid in the ADHD affected brain areas. (5)

Method:

We examined **10 boys and 4 girls aged 4–10 diagnosed with ADHD** (DSM-IV criteria, detailed neuropediatric and neuropsychological examination). Additional inclusion criteria were:

1. Unobtrusive clinical and lab chemical examination findings (no carnitine deficiency).
2. No changes in other therapies (medicinal therapy with MPH, occupational therapy, educational und pedagogical concepts) from 2 months before until 4 months after the L-carnitine treatment.
3. Written agreement of parents

All subjects were treated with **2x1g L-carnitine per day (the drinking solution CARNITENE sigma-tau®) during a time period of 2 months.**

Before and directly after the treatment phase with L-carnitine as well as after 2 and 4 months, respectively the children's behaviour was evaluated clinically and by means of parents/teacher questionnaires (CTRS-R-L).

Literature:

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