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Case Report

Micronutrient Treatment of Emotional Dyscontrol Following Traumatic Brain Injury

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Abstract

Introduction: Emotional dyscontrol following traumatic brain injury (TBI) impairs social relationships and employability. Micronutrients (minerals, vitamins) stabilize emotional lability in psychiatric patients, and various individual nutrients have been used to treat experimental brain injury in laboratory animals in the acute phase. However, the current case report appears to be the first documentation of micronutrients resulting in normalization of emotion regulation in a long-standing brain injury in a human.

Case presentation: A broad-spectrum formula of micronutrients was evaluated in a 35-year-old male who had incurred a severe TBI eight years previously. Resolution of most post-TBI symptoms was achieved during those eight years, but not his episodic loss of emotional control, which psychiatrists evaluated as being permanent. The trial of micronutrients began after five weeks of baseline symptom monitoring with a mood stability scale. By three months mood stability had improved markedly according to data submitted by two raters (the patient and his clinician) who were blind to each other's evaluations. Data collection continued for one year, showing significant improvement ($p<.0001$), at which time the patient reported that his emotional control had returned to his pre-TBI level. The improvements led to his establishing his own business and improving his family relationships.

Conclusion: Micronutrient treatment resulted in resolution of this patient's longstanding post-TBI emotional dyscontrol. Broad-spectrum micronutrient formulas are showing benefit for the treatment of mood lability in various types of psychiatric patients; this report indicates there is also potential value in using them for the emotional dyscontrol found in post-TBI patients.

ABBREVIATIONS

PCRS: Patient Competency Rating Scale

INTRODUCTION

Traumatic brain injury (TBI) is a significant health problem throughout the world, and its long-term consequences can impose many types of personal and societal burdens. Emotional dyscontrol can present as one of the most challenging post-TBI sequelae and may include irritability, impulsive aggression, agitation, and depression [1]. There have been attempts to explore the use of dietary therapies, especially in animal models, where the ketogenic diet, omega-3 fatty acids, and some individual nutrients (e.g., zinc) have shown some small benefits [2]. Otherwise, the primary clinical treatments for human post-TBI sequelae are typically psychosocial support and various psychiatric medications, often with incomplete resolution of the problem [1].

The particular mineral/vitamin formula utilized in this trial and its variants have been studied in more than 20 other investigations of emotion regulation, so it was a logical one to evaluate in the present case of post-TBI emotional dyscontrol that appeared to be permanent [3]. For instance, two children with explosive rage attacks were studied in a reversal design, which showed on-off control of symptoms [4]. However, previous studies have been primarily in patients with diagnosed psychiatric conditions, such as ADHD with depression [5]. This is the first report of its use in brain injury.

The question addressed by this trial was whether a micronutrient treatment that has been effective for improving emotional self-regulation in some psychiatric patients would also benefit a patient whose post-TBI recovery of emotion regulation had reached a plateau.

CASE PRESENTATION

At the time of his head injury, 'Tristan' was a 27-year-old married munitions specialist who worked for the British military and resided in London. His employment in bomb disposal included the dangerous task of operating a computer-controlled robot for bomb defusion, necessitating excellent concentration skills and emotion regulation. In April 2005 Tristan was a pedestrian when an intoxicated motorist drove onto the sidewalk, hitting him and throwing him against a brick wall. He sustained injuries to his right frontal lobe, a deep laceration of the right frontal supra-orbital region, fracture of the left tibia, and other lacerations in his lower limbs. He was initially in intensive care at London's Hillingdon Hospital, requiring ventilation for 2.5 weeks. He was discharged home and seen briefly as an outpatient at Headley Court. Then in July 2005 he was admitted to the Defence Medical

Rehabilitation Centre at Headley Court where he was treated until discharge 18 months later, in February 2007.

In 2007 a community rehabilitation programme was implemented by an appointed Case Manager (CL) who specializes in brain injury, with support workers and some input from a clinical psychologist. Tristan's main difficulty at that time was emotional lability with episodic dyscontrol. CL worked with Tristan in the community for four years, following which he did not require on-going input from a support worker. However, she remained a point of contact and began meeting with him regularly again in 2013 for the purposes of this trial. Hence, the clinician CL had close knowledge of Tristan and his level of emotional dyscontrol for six years prior to commencing micronutrient treatment.

At the time of the accident, various brain scans showed damage to the right front lobe of his brain that caused two small intra-cranial bleeds along with supra-orbital lacerations. A psychiatric report at the end of 2010, 5 ½ years post-trauma, stated that Tristan's continued mood changes and aggressive outbursts would continue to be barriers to complete rehabilitation. His post-TBI symptoms were further characterized as increased emotional lability and reduced power to regulate his feelings. The psychiatrist felt that "the continued nature of the symptoms so many years after his accident suggested that there was little prospect of further change…" The report concluded that Tristan's situation was expected to be "permanent."

In 2013 Tristan became aware of the medical literature using broad-spectrum micronutrients to treat mood dysregulation, irritability, and explosive rage [3, 4], and he asked to commence a trial of this treatment[i] while monitoring his response. At the time the trial began, he was 35 and was eight years post-injury [5].

The micronutrient formula consists of 36 ingredients, most of which are vitamins and vitamin-like compounds (A, B1, B2, B3, B5, B6, B9, B12, C, D, E, biotin, choline) and dietary minerals (calcium, iron, phosphorous, iodine, magnesium, zinc, boron, selenium, copper, manganese, chromium, molybdenum, potassium, nickel, vanadium), plus a few amino acids (e.g., l-glutamine) and phytonutrients (e.g., grape seed)[i].

The Patient Competency Rating Scale (PCRS) was used to monitor Tristan's response to treatment [6]. It consists of 30 questions, rated from 1 (cannot do) to 5 (can do with ease), yielding a maximum score of 150. A factor analysis in adults with acquired brain injury resulted in identification of four factors: activities of daily living, interpersonal skills, vocational skills, and emotional liability [7]. Because many of the PCRS items did not pertain to Tristan (e.g., daily living skills such as dressing himself or taking care of personal hygiene), a decision was made *a priori* that the outcome measure would be the mood lability factor, which has a maximum score of 30 (6 items times 5) (Table 1).

Though various people in Tristan's life occasionally submitted ratings, two raters provided data with sufficient consistency for statistical analysis: Tristan and his clinician CL. The clinician version of the PCRS is identical to the patient's, except the items are written in the third person. For this trial, the raters were blind to ratings outside their own as each individual submitted their monthly ratings to a third party for data entry. The blind was maintained throughout the 12-month trial.

Tristan had been medication-free for several years prior to commencement of the trial. He had been searching for a natural treatment, as he wanted to avoid psychiatric medications. He began the micronutrients December 10, 2013, at a dose of 8 capsules per day. Though compliance was not monitored directly, the authors have confirmed with the company that his regular purchase orders indicated consistent use of that dose.

Tristan and his clinician evaluated his mood for about five weeks as a baseline measure prior to commencing treatment, followed by 12 months of treatment. There was notable congruence between the two raters across the entire 12 months (Figure 1). A one-way repeated measures analysis of variance (ANOVA) resulted in a significant effect of time ($F(1,11) = 8.58$, $p < 0.0001$), indicating that scores of both raters were sensitive to symptom improvement over the course of the trial.

As shown in Figure 1, Tristan observed improvements within two months after beginning the nutrients, a change that is visible in the clinician's rating by the following month. So the efficacy of the intervention was clinically detectable to both raters within 2-3 months after Tristan began consuming the nutrient formula, although as he himself says (below), he began to sense some improvement in controlling his emotions after only two weeks. From the fifth month (three months after treatment began) until the end of the full year, the clinician and patient ratings paralleled each other, both approaching the maximum (and optimal) score possible for emotion regulation.

DISCUSSION

The case presented here is unusual in several respects, including the following: a) the patient's lengthy pre-TBI service in the military was in bomb disposal, providing strong confirmation of his prior steady emotional control; b) records indicated his eight years of post-TBI intensive therapy resulted in resolution of all other physical and mental symptoms; c) the patient himself initiated the micronutrient treatment after he searched the medical literature for non-pharmaceutical treatments of emotional dyscontrol; and d) one of the raters of his response to micronutrients was the case manager who had worked with him during rehabilitation for four years, and had close knowledge of his difficulties for six years prior to commencing the micronutrients.

Another interesting aspect of this case report is how well it fits into the new, emerging model of mental/brain health [8]. Research on seemingly diverse topics such as inflammation, gastrointestinal dysbiosis, and mitochondrial function is leading to a new framework of brain metabolism as the basis

Table 1: Items in the mood lability factor of the Patient Competency Rating Scale.

Item number	Content
16	Difficulty adjusting to unexpected changes
19	Difficulty controlling crying
23	Difficulty recognizing when something I say or do has upset someone else
27	Difficulty controlling my temper when something upsets me
28	Difficulty keeping from being depressed
29	Difficulty keeping my emotions from affecting my ability to go about the day's activities

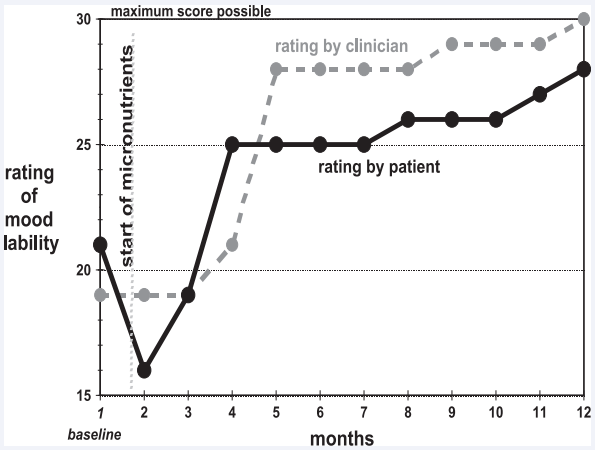

Figure 1 Mood liability ratings provided monthly for 12 months. Patient report is shown with the black line; clinician report is shown with a grey line.

of psychiatric symptoms. This new model of mental disorders addresses the importance of lifestyle factors (especially nutrient intake) for optimal mitochondrial output and brain function. It is not surprising, in that context, that emotional dyscontrol in a patient post-TBI would be as amenable to micronutrient treatment as is emotional dyscontrol in patients with primarily psychiatric diagnoses [e.g., 3, 4, 5].

CONCLUSION

This case report should be of significant interest to all who treat people post-brain injury. Treatment with broad-spectrum micronutrients carries no apparent risk [9], and holds the potential for benefit, especially in those with irritability and impulsive rage. Unlike pharmaceutical medications, micronutrients at safe doses do not often cause adverse events. In the present case, none were reported. Occasionally, an individual has reported some nausea, but even that side effect can be avoided by ensuring that the nutrients are consumed with food.Further research on the role of broad-spectrum micronutrients for the treatment of various brain/mental health disorders will enhance our understanding in ways that may benefit significantly more patients.

Patient's perspective

I completed some of the most high level rehabilitation training in the world at Headley Court between 2005 -2007. When I came home I continued with my Case Manager (CL) for rehabilitation into civilian life. A big question for me was, could I go to the supermarket without losing my temper about something and hitting someone. I felt that I tried with all the energy that I could muster, used the best strategies, and I just could not stop myself when I would begin to get angry. It seems to me that when you have had frontal lobe damage, you can learn strategies for all kinds of organizational problems, but you cannot really learn strategies for when your emotions are out of control. That changed when I started the nutrients. Within two weeks of starting EMPowerplus I began to feel improvements in my emotional control. I felt that it was giving me the tools that I needed to control my emotions. My life has improved a lot as a result of the nutrients, and I have had no side effects. I own my own business now, and I am getting along well with my family and friends. For the first time since the accident I am able to control my emotions. I feel like the person I was before the accident.

FOOTNOTE

[i]There are 36 ingredients of the formula called EMPowerplus Advanced. The majority of them are dietary minerals and vitamins. A detailed list of the nutrients and their doses can be found on every bottle as well as on the developer's website(Truehope.com). No author of this or any other publication on this formula isaffiliated financially with the company.

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