

Responses to cord blood therapy in global developmental delay: improvement of autistic features

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Introduction

Global developmental delay (GDD) is defined as a significant delay in two or more developmental domains. The prevalence of GDD is estimated to be 1% to 3% in children younger than 5 years. As most GDD patients have limited improvements with conventional treatments, stem cell therapy targeting neuro-regeneration is an emerging therapeutic option. Administration of umbilical cord blood mononuclear cells (UCB) has demonstrated clinical improvements without safety issues in autism patients. Considering poor performance across all developmental domains in GDD patient, the effect of UCB was studied in association with available results of developmental assessments. Changes of autistic features and cognitive improvement after UCB injection were also included.

Materials and methods

This study is a retrospective review of GDD patients who received autologous UCB between April 2010 and June 2016. Erythropoietin was administered together to potentiate UCB effects. Inclusion criteria were 1) diagnosis of GDD, 2) received autologous UCB, 3) available results of functional assessments before and after UCB administration. Exclusion criterion was the history of other previous stem cell therapy. A telephone survey was conducted to find any adverse events and the level of satisfaction in the developmental domains. Psychological measures including Childhood Autism Rating Scale (CARS) score in association with changes in other domains of development were observed. This study was approved by the institutional review board of ethics.

Results

The demographics of 31 eligible patients are described in Table 1. Eighteen patients responded to the telephone survey. No adverse events were reported with the longest follow-up duration of 13.4 years and the level of satisfaction for gross motor, fine motor, cognition, language, and social interaction domains were favorable to UCB therapy in most patients (Figure 1). Procedural content scored the highest followed by overall satisfaction in the survey. Gross Motor Function Measures was changed significantly after UCB injection in total and all subcategories except for Rolling. Three among seven patients with documented autistic features (CARS > 30) improved substantially at follow-up CARS assessment after UCB therapy (Figure 2).

Conclusion

In this retrospective review, autologous UCB potentiated with EPO in children with GDD was proved to be safe for over a decade. This study demonstrated a potential benefit of

UCB injection especially in GDD children with autistic features. Subsequent studies utilizing various psychomotor evaluations will be able to help identify the effective population of UCB therapy.

Table 1. Demographics of GDD patients with autologous cord blood cell transplantation

Characteristics	Mean \pm SD
Sex (male / female, n)	21/10
Gestational age (weeks)	38.7 \pm 1.6
Mode of delivery (NVSD/C/S, n)	19/12
Birth weight (kg)	3.18 \pm 0.5
Age of UCB injection (months)	55.0 \pm 27.1
Follow-up duration after UCB injection (months)	21.6 \pm 28.9
GMFCS level I/II/III/IV/V, n	22/4/1/2/2
Brain MRI findings, n (%)	
Normal	20 (64.5)
Mild ventricular dilatation	6 (19.4)
Partial agenesis of corpus callosum	2 (0.6)
Diffuse brain atrophy	2 (0.6)
Non-specific bilateral parietal T2 high signal intensities	1 (0.3)

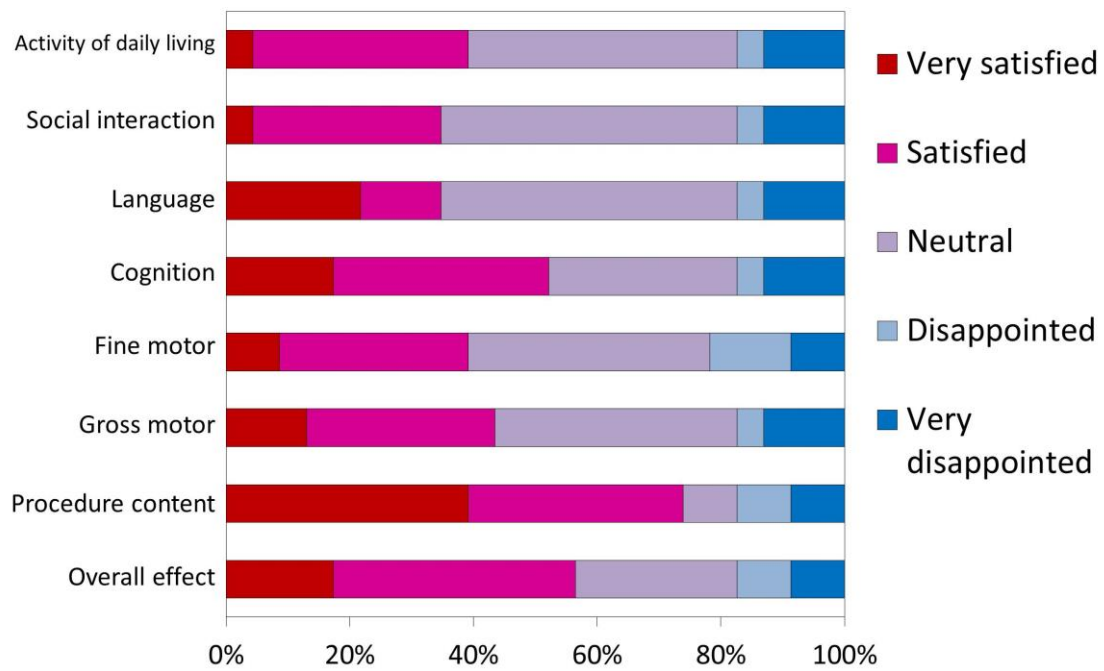


Figure 1. Satisfaction survey results Caregivers of 18 patients responded to the telephone survey on satisfaction of UCB injection for each developmental domain including gross motor, fine motor, language, cognition, social interaction and activities of daily living. The procedural content and overall effect were also questioned.

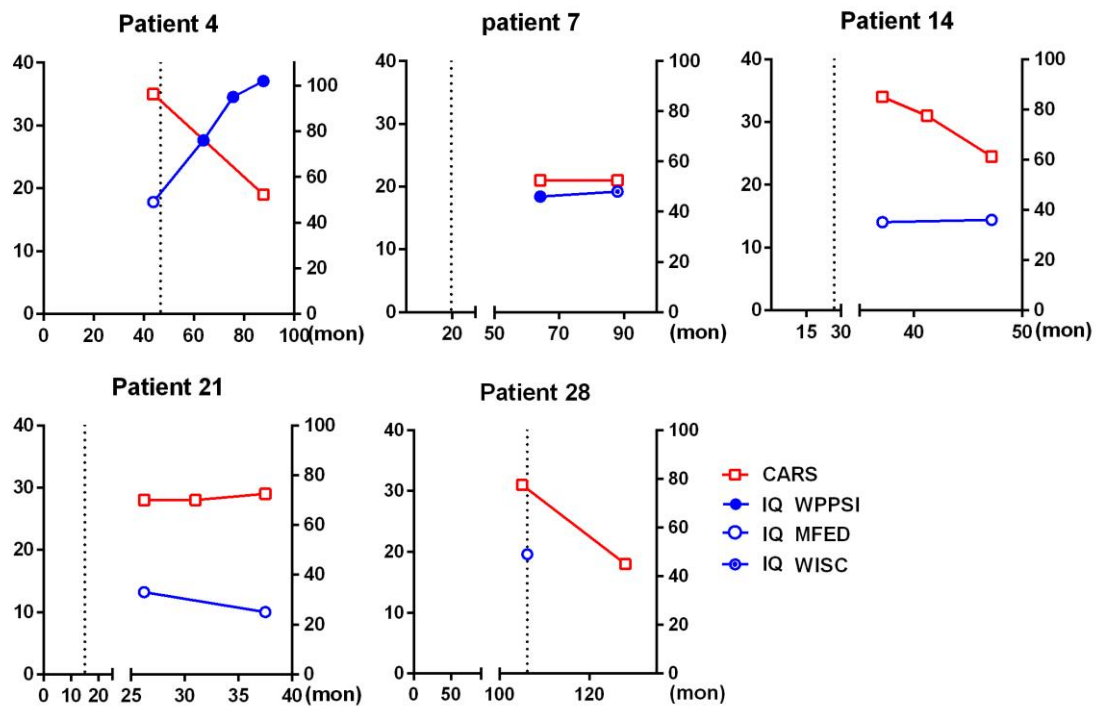


Figure 2. Psychological changes of autistic features after UCB injection Left Y axis stands for CARS scores while right Y axis stands for IQ scores. The dotted vertical lines indicate the time of UCB injection in each patient. IQ scores are based on Munich Functional Developmental Diagnostics (MFED) unless otherwise marked. CARS, Childhood Autism Rating Scale; IQ, Intelligence Quotient; WPPSI, Wechsler Preschool and Primary Scale of Intelligence Korean version; WISC, Wechsler Intelligence Scale for Children Korean version; mon, months