The Use of Stromal Vascular Fraction Therapy Combined with Autologous Activated Platelet-Rich Plasma in Autism Spectrum Disorder Patient: A Case Report

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Abstract

Background: Autism spectrum disorder (ASD) is a disorder of neurodevelopment with increasing prevalence due to its long and non-curative treatment. A shorter and curative-focused treatment is required. Among the various available treatment, stromal vascular fraction (SVF) and autologous activated platelet-rich plasma (aaPRP) may be a potential curative treatment option. **Case Description:** A case of 8-year-old male patient who had a chief complaint of delayed development and was diagnosed with mild-to-moderate autism from Childhood Autism Rating Scale (CARS) score of 30. Patient underwent spinal and intravenous infusions of SVF and aaPRP over the course of 16 weeks with total SVF cell number of 7.4 billion. Following treatment, the patient's CARS score improved to 27, indicating a reduction in autism severity. **Conclusion:** Patient showed significant improvements in overall neurodevelopmental aspect after finishing therapy with the combination of SVF and aaPRP without any significant adverse events.

Keywords: Autism Spectrum Disorder, Stromal Vascular Fraction, Platelet-Rich Plasma.

Introduction

Autism spectrum disorder (ASD) is a disorder of neurodevelopment characterized by the lack of social communication, restricted interests, and repetitive behaviors in the first 3 years of life. Over the past two decades, the prevalence of ASD has increased. Currently, large scale surveys showed that 1-2% of the population suffers from ASD. Regarding the gender, ASD affects 2-3 times more males compared to females. When untreated, individuals with ASD will be unable to be independent and interact with others socially. This will pose a problem

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for the family raising the child and will be a burden for the society in the future.[1,2]

Currently, the treatment modality of ASD involves prescribed medications and psychosocial therapies. However, current available modalities are not curative treatment of ASD. Moreover, observed improvements of therapy requires a long duration of therapy. Thus, researchers keep working on finding a curative treatment of ASD.[3,4] To date, there are hypotheses regarding the use of stem cell therapy as a curative treatment of ASD. Although current evidence is far from acknowledging stem cell therapy as a curative treatment of ASD, available theories may prove it possible to cure ASD. [5] However, stem cell isolation requires 1-2 week-culture period which is not time- and cost-efficient. A relatively shorter option to obtain stem cells is through lipoaspiration obtaining stromal vascular fraction (SVF). To further obtain greater number of stem cells in SVF, the use of autologous activated-platelet rich plasma (aaPRP) has been proven to be effective.[6] Therefore, this case report is created to report the use of SVF and aaPRP on a child with ASD.

Case Description

An 8-year-old male patient with chief complaint of delayed development presented to Hayandra Clinic with his parents. On presentation, patient was found to avoid eye contact and difficulty to communicate. Patient was diagnosed of delayed development since the age of 2 years. The mother was healthy during pregnancy and had normal delivery when giving birth to him. He was breastfed until the age of 3 months. On further history taking, the parents reported that he has a habit of urinating and defecating everywhere despite his age. The patient was suspected to have autism spectrum disorder (ASD) with elimination disorder and delayed development.

To further confirm the working diagnosis, the Childhood Autism Rating Scale was used to diagnose ASD. The patient was found to have a score of 30 which indicates mild to moderate ASD. On development test, the patient was found to have a social personal skills equivalent to a child with the age of 2 years and 5 months old; fine motor skills equivalent to a child of 3 years old; gross motor skills equivalent to a child of 3 years and 5 months old; and linguistic skills equivalent to a child of 18 months old. The patient was then suggested to undergo stromal vascular fraction (SVF) therapy combined with autologous activated platelet-rich plasma (aaPRP) which the parents agreed to after being given explanation and informed consent.

The therapy consisted of 1 spinal and intravenous infusion of SVF combined with aaPRP on the day of lipoaspiration procedure under light sedation, continued with 3 intravenous infusions of SVF combined with aaPRP, and 4 intravenous infusions of aaPRP only. Patient underwent fat aspiration procedure in Hayandra Clinic on October 6, 2021, by physicians with related competencies (plastic surgeon, pediatrician, and neurologist). The lipoaspirates were further processed through in-house xenofree enzymatic process to obtain SVF. Total cell number obtained was 7.95 billion cells. The details of each cell number for each SVF are shown in Table 1. Figure 1 shows the SVF cells.

Table 1: Details of Patient's SVF.

Cells Product	Lipoaspirate Volume (cc)	Adipose Volume (cc)	SVF Volume (cc)	Cell number (x 106 cells)	Viability (%)	Administration (day)
			SVF			
Intravenous (IV)	103	18	22	7.420	99.81	1
Spinal	75	8	3	530	97.22	1
Re-SVF 1 (IV)	73	8	20	520	98.11	9
Re-SVF 2 (IV)	-	-	5	1.575	99.16	14
Re-SVF 3 (IV)	-	-	5	1.050	97.22	22

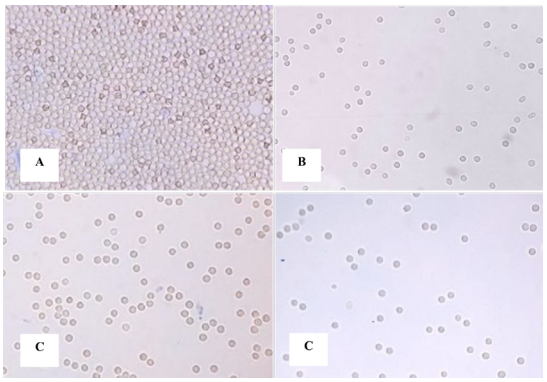

Figure 1: Morphological Characteristics of Stromal Vascular Fraction (SVF) Observed Under an Inverted Microscope: (A) SVF, (B) re-SVF 1, (C) re-SVF 2, and (D) re-SVF 3; black bar = 100 µm.

After 4 SVF therapy was done, only 4 aaPRP therapy was given every 2 weeks. The patient was evaluated after finishing the 4 SVF therapy. The patient was more aware of himself and the environment. He was able to point to things he wanted and shaking his head to things he did not want. Moreover, he had a better memory on things repeated and better focus and eye contact. Regarding hyperactivity and responsivity towards sounds, the patient was found to be less hyperactive compared to how he was before the therapy and respond to sounds normally. After finishing the whole therapy, the patient was able to give a "high-five" and wave to say goodbye. Improvement of CARS was observed with a score of 27.

Discussion

Many studies have tried to find the main cause of

autism spectrum disorder (ASD). However, there are various theories regarding the cause of ASD. The most common theories are immune dysfunction and synaptic pathology. These theories explained that ASD is caused by the inflammatory state in the brain and reduced neural connectivity especially in the association cortex which manifests as the symptoms of ASD. Thus, various studies have hypothesized the use of stem cells for treating ASD due to its regenerative and anti-inflammatory potential.[7] As long culture-period is required to obtain MSCs, SVF is more preferred due to its relatively shorter time which is cost- and time-efficient. Thus, we reported the use of SVF and aaPRP in a patient with ASD. A significant factor for SVF therapy is cell number with a general expectation of higher administered cell number is proportionate to the efficacy. To our knowledge, our case report is the first to process SVF in a child with ASD with a cell number reaching up to 7.4 billion. This number is very high as most procedures only reach cell number around 1 billion cells. The patient showed significant developmental improvement over the course of the treatment. Observed significant developmental improvement were in interest towards things, better eye contact, and imitation of action. Our report further added current available finding by Thanh et al that reported reduction of Childhood Autism Rating Scale (CARS) score after stem cell therapy.[8]

These improvements indicated the improvement of neural connectivity mainly in the association cortex. A possible explanation for this finding is the mesenchymal stem cells (MSCs) in SVF plays a role in its regenerative potential through synaptogenesis and modulated the inflammation in the brain. Moreover, the cell number of the patient reaching 7.4 billion may play a role in the efficacy of the SVF therapy as reported in previous study.

Aside from SVF, we also added the use of aaPRP. The addition of aaPRP to SVF has been proven to enhance the proliferation and action of MSCs which resulted in better efficacy.[6,9] Not to forget that the patient's cell number reaches over 7 billion which is rarely found especially in children. Over the course of the therapy, no significant adverse event was observed. Our finding regarding the safety of SVF and aaPRP in a child with ASD further adds up and confirms the study regarding the safety of SVF and aaPRP.[6,10]

Overall, with the cell number in SVF reaching up to 7.4 billion, there were significant improvements and no significant adverse events observed. However, the information is still limited and only 1 patient was reported in our study. However, this case report may be used as preliminary evidence to further conduct studies with larger samples. To further confirm our findings, a preliminary study and randomized controlled trial is required.

Conclusion

The combination of stromal vascular fraction (SVF) and autologous activated platelet-rich plasma (aaPRP) therapy is a promising therapy for children with ASD shown by improvements in neurodevelopmental aspects and the safety of the therapy despite high cell number up to 7 billion. Further studies with larger sample size and control groups are required to confirm our findings.

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Conflict of Interests

The authors declare that they have no conflict of interests.

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