Section: Miscellaneous

Case Report

RETHINKING: ROLE OF INSULIN RESISTANCE IN POLYCYSTIC OVARIAN SYNDROME: A CASE REPORT

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ABSTRACT

Polycystic Ovarian Syndrome (PCOS) in adolescents presents complex therapeutic challenges. Standard treatments focus on symptomatic relief. An 18-year-old female presented with a three-year history of irregular menstruation, obesity (108 kg), medication-dependent menstrual cycles, hypothyroidism, facial acne, and hyperpigmentation. The patient had abnormality in the mitochondrial dynamics, insulin resistance and metabolism. This case highlights the successful use of regenerative and systems-based therapies like BIONICA-MDI to address underlying mitochondrial dysfunction in a young patient with PCOS. By the third month, the patient's menstrual cycles normalized without hormonal induction. Acne and hyperpigmentation improved significantly. fasting insulin dropped to 8.13 µIU/ml, Sr. TSH normalized to 3.5 µIU/ml, and Sr. DHEA levels declined. Her weight decreased to 89 kg by the fourth month. These findings suggest systemic metabolic and hormonal recalibration. This case demonstrates the potential of stem cell and BIONIA-MDI in adolescent PCOS, with meaningful improvements in reproductive, dermatologic, and metabolic parameters. Such multimodal, systems-level interventions may offer a disease-modifying alternative to conventional symptomatic management.

INTRODUCTION

Polycystic Ovarian Syndrome (PCOS) is a chronic endocrine condition that affects women of childbearing age and causes metabolic and reproductive problems at every stage of life. The condition's etiology differs greatly based on environmental factors such as lifestyle, genotype, and ethnic origin.[1] Clinical Presentation (Rotterdam Criteria Phenotypes) is widely used for diagnosing PCOS, requiring at least 2 out of 3 features: Ovulatory Dysfunction (OD), Hyperandrogenism (HA), Polycystic Ovarian Morphology (PCOM) as seen on an ultrasound.[2] Based on combinations of these criteria, four main phenotypes are recognized: Phenotype A, B, C, D.

PCOS prevalence continues to grow as the underlying mechanisms remain inadequately understood. PCOS leads to reproductive challenges and psychological disorders. The prevalence varies between 8% and 13%, depending on the population.[3] PCOS is commonly associated with aberrant follicular development, obesity, insulin resistance (IR), compensatory hyperinsulinemia, hyperandrogenism, and low-grade inflammation in up to 80% of individuals.[4] Conventional treatments such as OC pills, insulin sensitizers like metformin, exercise, and weight loss therapy, including diet, only help to manage PCOS instead of treating the root cause.

Despite its diversity, PCOS contains heritable traits that could be linked to epigenetic programming or mitochondria inherited from the mother,[5] and have been identified in numerous metabolic and cardiovascular diseases.

PCOS patients exhibit irregularities in dynamics of mitochondria, structure, biogenesis, and the membrane potential.[4] Exercise and other lifestyle modifications have been utilized to enhance mitochondrial activity. Improved insulin sensitivity, menstrual cyclicity and ovulation, decreased body weight, total testosterone, hirsutism, and improved

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mental health are just a few of the clinical features of PCOS.

In this article, we will be discussing mesenchymal stem cells (MSCs) and BIONICA-MDI for treatment of PCOS.

CASE PRESENTATION

An 18-year-old female presented to StemRx Biosciences Solutions Pvt Ltd, Navi Mumbai, with complaints of persistent fatigue, progressive weight gain (108 kg), facial acne, hyperpigmentation over the neck, axillae, and groin, and irregularities in menses for three years. Menarche occurred at age 14, following menstrual irregularities. The patient menstruates with progesterone withdrawal and bleeds for around 30 - 45 days, followed by amenorrhea of 3 - 4 months. This patient was diagnosed with hypothyroidism and was taking Thyronorm 25 mcg for 2 yrs.

Laboratory findings: LH (4.11 µIU/ml), FSH (4.71 µIU/ml), along with mildly elevated TSH (4 mIU/L) and fasting insulin (42.9 mIU/ml), and a HOMA-IR score of 5.7 AGU, indicating severe IR. DHEA and elevated Sr. AMH 12.47 ng/ml., Sr. Cortisol levels at 8 am and 4 pm were normal, while ESR and IL-6 were raised, reflecting low-grade systemic inflammation. Ultrasound of lower abdomen revealed PCOS and hepatomegaly, in [Figure 3].

Figure 1: a. Pre-treatment weight gain. b. Post-treatment weight loss

Treatment Protocol: The patient was initiated with regenerative therapy protocol addressing endocrine dysfunction, metabolic inflammation, IR and dermatological issues. Interventions included ovarian rejuvenation with MSC therapy, intradermal stem cell therapy for acne and dermal repair, 19 sessions of BIONICA-MDI therapy to improve systemic insulin sensitivity, structured and targeted physiotherapy.

RESULTS

At 3 months, the patient demonstrated significant weight loss improvement (95 kgs), regularization of menses, normalization of TSH (3.5 µIU/ml), and reduced fasting insulin (8.13 µIU/ml). By 4 months, her weight further decreased (89 kgs), regular menses, reduced acne, reduced hyperpigmentation, and mood improvement.

Figure 2: a Pre-treatment- Facial Acne. b Post-treatment- No visual Facial acne

Figure 3: Pre-treatment Ovary Scans (a. & b. Left & Right Ovarian parameters, c. Polycystic appearance of both the ovaries.)

Figure 4: Post-treatment Ovary scans (a. Both the ovaries with Follicular recruitment, b. & c. Left & Right Ovarian parameters)

DISCUSSION

Patients with PCOS face significant lifetime repercussions despite changing lifestyles and receiving medical treatment. Hormonal imbalances, inflammation, compromised ovarian microenvironment,[5] impaired biogenesis, and mitochondrial damage are indicators of lower adenosine triphosphate (ATP) levels,[6] higher reactive oxygen species (ROS) levels, and reduced energy generation strongly linked to decreased oocyte quality and decreased conception rates.[7]

Clinical and genetic heterogeneity in PCOS is associated with hyperandrogenism because of abnormalities in the steroidogenic pathway.[8] The potential of MSCs to control inflammation, alter the immune system, suppress CYP11A1, CYP17A1, and DENND1A gene expression and encourage tissue

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repair in PCOS patients. MSCs re-establish better ovarian function, hormone levels and IR.[9]

The excessive supply of nutrients in obesity has been shown to overwhelm the Krebs cycle and the mitochondrial respiratory chain, which leads to mitochondrial dysfunctions.[10] Obesity, inflammation, hyperlipidaemia, hyperglycaemia, hyperandrogenaemia, and IR contribute to elevated oxidative stress (OS) in PCOS. BIONICA-MDI is a promising strategy enhancing energy metabolism and reducing OS.

To cater to these metabolic dysfunctions, BIONICA-MDI therapy has proven to be an effective treatment. It stops and reverses complications by

- Reducing the damage from high lipid metabolism &
- Restoring missing cellular energy

Figure 5: BIONICA-MDI setup

The liver produces 43 enzymes, which are required for the generation of ATP in each organ. BIONICA-MDI is a crucial part of this treatment where pulsatile insulin increases the metabolic enzymes in glycolysis and Krebs cycle, maintains peripheral insulin receptor activity and glucose uptake, and has a stronger hypoglycaemic effect, by minimizing the harm caused by excessive lipid metabolism and replenishing depleted cellular energy, decreased OS, and inflammation. It prevents and reverses problems. These regenerative approaches offer a potential therapeutic avenue for long-term PCOS management.

The highlight of this case is the potential of BIONICA-MDI and MSCs for managing PCOS and providing a significant point in the patient's recovery. It helped lose weight, evened skin tone, reduced acne, and built normal metabolism recovery of the ovarian microenvironment.

CONCLUSION

In conclusion, the above case highlights the promising potential of MSCs in combination with BIONICA-MDI therapy to manage PCOS, a complex endocrine disorder that affects women's health. The patient experienced overall improvement in weight loss, menstrual regularity, balance in hormonal levels and skin conditions. This shows the efficacy of innovative regenerative therapies. By targeting the mechanisms such as insulin resistance, inflammation and mitochondrial dysfunction, these therapies contribute to long term metabolic and reproductive health. This case offers hope for enhanced quality of life and reproductive outcomes for women with PCOS.

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