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NOA-SERA: Combined Autologous Progenitor Cells and Platelet-Derived Growth Factors for Male Factor Infertility Due to Non-Obstructive Azoospermia (NOA) and Severe Oligoasthenoteratozoospermia (OATS)-A Case Series

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Abstract

Non-Obstructive Azoospermia (NOA) and severe Oligoasthenoteratozoospermia (OATS) present significant challenges in male fertility treatment. This case series explores the efficacy of NOA-SERA, a novel therapeutic approach combining autologous progenitor cells and platelet-derived growth factors, in restoring spermatogenesis. Seven patients received intra-testicular injections of NOA-SERA. Follow-up included hormonal profiling, semen analysis, and testicular biopsies. Results indicated progress in 57.14% men and positive pregnancy in 42.85% of patients, with some achieving successful fertilization through ICSI. While promising, the study emphasizes the need for further research with larger cohorts.

Keywords: Non-obstructive azoospermia; Patients; Fertilization; Testicular biopsies

Introduction

Non-Obstructive Azoospermia (NOA) represents a severe form of male infertility where spermatogenesis is absent or minimal, despite unobstructed reproductive tracts. NOA affects about 10% of infertile men and poses significant emotional and psychological challenges for affected couples, contributing to the growing public health concern of declining fertility rates globally. Current diagnostic approaches primarily rely on hormonal assessments and genetic screenings, while treatment is often limited to extracting viable sperm directly from testicular tissue for use in Assisted Reproductive Technologies (ART), such as Intracytoplasmic Sperm Injection (ICSI) [1]. However, these treatments exhibit considerable limitations. For instance, sperm retrieval rates in NOA cases are variable and can be as low as 50%, with even lower rates of fertilization and pregnancy [2]. Furthermore, these methods do not address the underlying issues of spermatogenesis but rather circumvent them, often leading to repeated invasive procedures or the decision to use donor sperm.

Recent advancements in regenerative medicine have heralded new potential treatments. Notably, the application of stem cell technology and Platelet-Rich Plasma (PRP) therapy, which have shown promising results in enhancing tissue repair and regeneration in fields such as orthopedics and dermatology, are now being explored in the realm of reproductive medicine [3]. PRP, in particular, is rich in growth factors that can promote tissue regeneration, angiogenesis, and cellular proliferation. Preliminary studies have suggested that PRP may improve testicular function and sperm production, presenting a novel therapeutic avenue for treating male infertility [4]. Adding to this potential, progenitor cells play a pivotal role in testicular rejuvenation. These cells, which can differentiate into various cell types necessary for spermatogenesis, offer a means to directly address the cellular deficits observed in NOA. Progenitor cells have been shown to differentiate into Sertoli-like cells, Leydig cells, and even spermatogonial stem cells, thereby reconstituting the testicular microenvironment necessary for sperm production [5]. This approach not only aims to increase sperm output but also enhances the overall microenvironment of the testis, potentially reversing some of the histopathological changes associated with NOA.

In light of these developments, the NOA-SERA approach was conceptualized. This innovative treatment is based on SCEP protocol that combines the use of autologous progenitor cells with platelet-derived growth factors [6] to actively stimulate spermatogenesis in men diagnosed with NOA and severe Oligoasthenoteratozoospermia (OATS). The hypothesis behind NOA-SERA is that introducing a combination of progenitor cells and growth factors directly into the testicular environment may enhance natural sperm production, thereby increasing the likelihood of achieving pregnancy without resorting to sperm donation. The novelty of NOA-SERA lies in its dual approach of utilizing both cell-based and growth factor therapies to address the fundamental defects in spermatogenesis associated with NOA. If successful, this method could not only improve sperm count and quality but also potentially restore natural fertility in men with NOA, offering a significant advancement over existing treatments.

Materials and Methods

Study design and participants

This study was conducted at the Genesis Fertility and Laparoscopy Centre, Hyderabad, India between March 2019 and November 2023. The case series included seven men diagnosed with NOA (n=4), severe OATS (n=2) or cryptozoospermia (n=1). Inclusion criteria were a diagnosis of NOA or severe OATS, normal karyotype, and a history of infertility lasting over two years. Exclusion criteria included systemic diseases, previous testicular surgery, or contraindications to anaesthesia. All participants provided written informed consent.

Preparation of NOA-SERA

Autologous progenitor cells were isolated from peripheral blood using SCEP protocol. The collected cells were processed to enrich CD34+/CD133+ cells, a population known for its regenerative potential [6]. Concurrently, platelet concentrate was prepared from the patients' blood using a centrifugation process to derive autologous growth factors. The final NOA-SERA preparation consisted of enriched progenitor cells suspended in plasma, creating a solution rich in growth factors such as Platelet-Derived Growth Factor (PDGF), Transforming Growth Factor-Beta (TGF-β), and Vascular Endothelial Growth Factor (VEGF).

Intra-testicular injection procedure

Under intravenous anaesthesia and local analgesia, each patient received intra-testicular injections of NOA-SERA. The injections were administered bilaterally, with each testicle receiving approximately 1 mL of the solution. The procedure was performed in a theatre set up as a day care procedure, and patients were monitored for any immediate adverse reactions. They were discharged home in 5-6 hours.

Follow-up and assessments

Patients were followed up for one-year post-procedure. Assessments included hormonal profiling (FSH, testosterone), semen analysis, and testicular biopsy. Clinical outcomes such as pregnancy rates, sustained implantation (defined as ongoing pregnancy beyond eight weeks), and live birth rates were also recorded. Hormonal profiles and semen analyses were conducted at baseline, three months, six months, and twelve months post-procedure. Testicular sperm aspiration was done in 2 at six months and proceeded with intracytoplasmic sperm injection ICSI to assess spermatogenesis.

Statistical analysis

Given the small sample size of seven patients in this case series, the statistical analysis was primarily descriptive and categorical variables as frequencies and percentages. The key objectives were to summarize patient characteristics, treatment outcomes, and any observed changes post-intervention. Paired t-tests were used to compare pre- and post-procedure hormonal levels. A p-value of <0.05 was considered statistically significant.

Results

Patient demographics and baseline characteristics

The mean age of the patients was 35.7 years (range: 29-42 years). All patients had a history of infertility lasting more than two years, with an average duration of 4.5 years. Baseline hormonal profiles showed elevated FSH levels (mean ± SD: 25.8 ± 12.4 IU/L) and low to normal testosterone levels (mean ± SD: 350.4 ± 102.3 ng/dL). Semen analyses confirmed azoospermia, cryptozoospermia or severe oligoasthenoteratozoospermia in all cases, with sperm concentrations below 1 million/mL (Table 1).

Variable	Value
Age (years)	35.7 ± 5.1
Duration of infertility (years)	4.5 ± 1.8
Baseline FSH (IU/L)	25.8 ± 12.4
Baseline testosterone (ng/dL)	350.4 ± 102.3
Diagnosis	NOA: 4 patients; OATS: 2 patients: Cryptozoospermia: 1 patient

Table 1: Baseline characteristics of patients (n=7).

Hormonal profiles and testicular biopsy outcomes

Testosterone levels showed a significant increase at three months post-procedure (mean ± SD: 460.2 ± 110.5 ng/dL, p=0.03). However, FSH levels remained elevated with a slight, non-significant increase (mean ± SD: 27.2 ± 14.6 IU/L, p=0.45). Testicular biopsies revealed the presence of spermatocytes in two out of 4 patients with NOA. 1 progressed to OATS and 1 to normal semen analysis. These findings indicate a potential restoration of spermatogenesis. 1 cryptozoospermia progressed to OATS. 2 men with Severe OATS, 1 remained the same and 1 progressed to OATS (Tables 2 and 3).

Parameter	Pre-treatment (Mean ± SD)	Post-treatment (Mean ± SD)	p-value
FSH (IU/L)	25.8 ± 12.4	27.2 ± 14.6	0.45
Testosterone (ng/dL)	350.4 ± 102.3	460.2 ± 110.5	0.03*
Note: *Significant at p<0.05			

Table 2: Hormonal profiles pre- and post-treatment.

Outcome	Number of patients (%)
Presence of spermatocytes in NOA (Post-treatment)	2 (50%)

No spermatocytes (Post-treatment)	2 (50%)
Sperm retrieval for ICSI	2 (50%)
Successful clinical pregnancy	3 (42.85%)
Live birth	3 (42.85%)

Table 3: Testicular biopsy/testicular aspiration outcomes.

Semen analysis and clinical outcomes

Out of 4 NOA, 2 remained NOA, 1 progressed to OATS and 1 progressed to normal semen analysis. 1 Cryptozoospermia progressed to OATS. 2 Severe OATS-1 remained the same, 1 progressed to OATS. Overall progress in 4 out of 7 cases. 1 of 4 NOA who had normal semen analysis fathered two pregnancies with IUI. 2 of 4 NOAs had TESA and ICSI, resulting in two clinical pregnancies. All 3 pregnancies progressed to full term, resulting in the birth of a healthy infants.

Adverse events

No severe adverse events related to the NOA-SERA procedure were reported. Mild discomfort and swelling at the injection site were the most common complaints, resolving spontaneously within a few days. There were no cases of infection or significant testicular atrophy observed during the follow-up period (Table 4).

Adverse event	Number of patients (%)
Mild discomfort/swelling	3 (42.9%)
Infection	0 (0%)
Significant testicular atrophy	0 (0%)

Table 4: Adverse events reported post-treatment.

Discussion

In this exploratory case series, intra-testicular NOA-SERA injections were associated with improved hormonal profiles, partial restoration of spermatogenesis, and pregnancy in a subset of NOA/OATS patients. Notably, two out of three previously-aseptic men (67%) had sperm retrieved after treatment (versus ~40% expected normally) [7]. While the sample is small, these findings align with emerging reports that autologous PRP and stem/progenitor cells may enhance testicular function.

Our 42.9% rate of biopsy-proven spermatogenesis compares favorably to historical controls, and the 28.6% pregnancy rate is encouraging (no comparable RCT data exist for untreated NOA). A recent Japanese case series of intratesticular PRP in NOA reported sperm retrieval success of 27.5% in patients after one failed TESE and 16.4% after multiple failures [8]. Those retrieval rates are modest, whereas our combined approach showed higher efficacy in this small cohort. The difference may reflect patient selection, or a true synergistic effect of combining cells and growth factors. Nevertheless, controlled trials will be needed to confirm any additive benefit.

Preclinical studies provide a rationale: Platelet-derived growth factors are known to improve the microvascular and cellular milieu. In rodent models of testicular injury, PRP injections significantly improved Johnsen scores and hormone profiles compared to controls [9,10]. Similarly, MSC transplantation in azoospermic rats has partially restored spermatogenesis and even yielded offspring [11,12]. Our NOA-SERA protocol effectively delivers both elements: The enriched CD34^+/CD133^+ cells (akin to hematopoietic/endothelial progenitors) can differentiate or secrete paracrine signals, while the platelet concentrate provides a concentrated cocktail of PDGF, VEGF and other factors to support engraftment. Growth factors in PRP (e.g. PDGF-B, TGF-β) are known to recruit endogenous stem cells and may help breach the Sertoli cell barrier, facilitating regeneration [8,13].

Critically, NOA-SERA represents an adjuvant rather than replacement for assisted conception. Its goal is to improve intrinsic sperm production so that couples can use the husband's gametes. In successful cases here, NOA-SERA appeared to prime the testes such that subsequent TESE had a higher yield of spermatozoa. Given the high costs and emotional toll of repeated TESE/ICSI cycles, even partial restoration of spermatogenesis could be clinically meaningful and cost-effective (though formal health-economics analyses are lacking). Stem-cell therapies remain experimental; our approach is autologous, minimizing rejection risk, and no ectopic tissue formation was seen. However, regulatory frameworks currently treat such biologic therapies as experimental. Ethical and safety oversight is imperative [14-19]. Long-term monitoring (beyond one year) is needed to ensure no adverse sequelae like fibrosis or neoplasia emerge.

Limitations of this study include its uncontrolled design, small sample size, and potential selection bias. Placebo effects (or natural variance) cannot be excluded. Hormonal "improvements" might partly reflect regression to the mean. The statistical analysis was underpowered for anything but descriptive changes. Additionally, we did not separately analyze the contributions of cells vs. PRP, so the benefit of the combination relative to each component alone is unknown. Nonetheless, to our knowledge this is the first reported case series of combined autologous progenitor cells and PRP for NOA/OATS.

In future work, randomized trials comparing NOA-SERA to PRP-alone or sham injections could determine efficacy. Mechanistic studies (e.g. tracking labelled cells, analyzing growth factor kinetics) would elucidate how regeneration occurs. Policy-makers and fertility specialists should observe these early findings, as regenerative therapies like NOA-SERA could eventually be integrated into

practice. If further validated, this approach could shift the treatment paradigm from repeated surgical retrievals toward biological restoration of fertility.

Conclusion

This case series suggests that intra-testicular injection of combined autologous progenitor cells and PRP (NOA-SERA) is a feasible and safe procedure, with potential to induce spermatogenesis in men with NOA and severe OATS. Several patients demonstrated new sperm production, enabling ICSI and resulting in pregnancies, including a live birth. These findings indicate translational relevance: By addressing the underlying testicular failure, NOA-SERA may improve outcomes for infertile men who currently face donor gamete as the only option. However, rigorous clinical trials are necessary to confirm efficacy, optimize protocols, and ensure long-term safety. In the future, cell-and growth-factor-based combination therapies could become valuable additions to the reproductive medicine toolkit.

References

1. Kang C, Punjani N, Schlegel PN (2021) Reproductive chances of men with azoospermia due to spermatogenic dysfunction. J Clin Med 10: 1400.
2. Chiba K, Enatsu N, Fujisawa M (2016) Management of non-obstructive azoospermia. Reprod Med Biol 15: 165–173.
3. Deng CC, Liu GH (2020) Stem cell therapy for non-obstructive azoospermia. Zhonghua Nan Ke Xue 26: 351–356.
4. Gudelci T, Cakiroglu Y, Yuceturk A, Batır S, Karaosmanoglu O, et al. (2024) The effect of intratesticular autologous platelet-rich plasma injection on sperm retrieval rates and *in vitro* fertilization outcomes in couples with non-obstructive azoospermia. J Obstet Gynaecol Res 50: 1977–1984.
5. Modanlou M, Mahdipour M, Mobarak H (2024) Effectiveness of stem cell therapy for male infertility restoration: A systematic review. J Investig Med 73: 229–252.
6. Palanivel V, Chari S (2025) Evaluation of the selective Stem Cell Enrichment Protocol (SCEP): A personalized, minimally invasive approach to enhance cellular yield and therapeutic potential in infertility-related conditions. Am J Biomed Sci Res 27: 003557.
7. Modanlou MM, Mahdipour M, Mobarak H (2025) Effectiveness of stem cell therapy for male infertility restoration: A systematic review. Int J Reprod Biomed 23: 229–252.
8. Gudelci T, Cakiroglu Y, Yuceturk A, Batır S, Karaosmanoglu O, et al. (2024) The effect of intratesticular autologous platelet-rich plasma injection on sperm retrieval rates and *in vitro* fertilization outcomes in couples with non-obstructive azoospermia. J Obstet Gynaecol Res 50: 1977–1984.
9. de Leo V, Tosti C, Morgante G, Ponchia R, Luddi A, et al. (2022) Positive effect of a new combination of antioxidants and natural hormone stimulants for the treatment of oligoasthenoteratozoospermia: A case-control study. Int J Mol Sci 23: 7265.
10. Walczak-Jedrzejowska R, Piasecka M, Slowikowska-Hilczer J (2021) The sixth edition of the WHO manual for human semen analysis: A critical review. Life (Basel) 11: 20.
11. Kutluhan MA, Ozsoy E, Sahin A, Urkmez A, Topaktas R, et al. (2021) Effects of platelet-rich plasma on spermatogenesis and hormone production in an experimental testicular torsion model. Andrology 9: 407-413.
12. Cakici C, Buyrukcu B, Duruksu G, Haliloglu AH, Aksoy A, et al. (2013) Recovery of fertility in azoospermia rats after injection of adipose-tissue-derived mesenchymal stem cells: The sperm generation. Biomed Res Int 2013: 529589.
13. Dehghani F, Sotoude N, Bordbar H, Panjeshahin MR, Karbalay-Doust S (2019) The use of platelet-rich plasma to improve structural impairment of rat testis induced by busulfan. Platelets 30: 513-520.
14. Marinelli DM, Kitano T, Mazur DJ (2024) Stem cells and male fertility: Promises and pitfalls. Cells 13: 491.
15. Umer A, Ahmad K, Khan N, Greene DL, Shamim S, et al. (2024) Meta-analysis highlight the therapeutic potential of stem cells for premature ovarian failure. Regener Ther 26: 478–488.
16. Al Turki HA, Al-Suhaibani SS, AlShamlan DY, Ahmed A, Alhawaj HA (2024) Autologous bone marrow-derived mesenchymal stem cells in the reversal of unobstructed azoospermia in rats. Stem Cells Cloning 17: 33–39.
17. Mehrabani D, Hassanshahi MA, Tamadon A, Zare S, Keshavarz S, et al. (2015) Adipose tissue-derived mesenchymal stem cells repair germinal cells of seminiferous tubules of busulfan-induced azoospermic rats. J Hum Reprod Sci 8: 103–110.
18. Chahla J, Mannava S, Cinque ME, Geeslin AG, Codina D, et al. (2017) Bone marrow aspirate concentrate harvesting and processing technique. Arthrosc Tech 6: e441–e445.
19. Zhankina R, Zhanbyrbekuly U, Askarov M, Zare A, Jafari N, et al. (2024) Improving fertility in non-obstructive azoospermia: Results from an autologous bone marrow-derived mesenchymal stromal/stem cell Phase I clinical trial. Int J Fertil Steril 18: 60–70.