# Integrating Lifestyle Modifications and Advanced Sperm Separation Technology: A Case Study on Overcoming Male Infertility Using the LensHooke CA0 Device

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# INTRODUCTION

ssisted reproductive technology (ART), which is assisted reproductive technology, is a field that uses advanced healthcare facilities to deal with infertility issues in both males and females. 'Infertility' is a term used for an individual who is unable to conceive even after 365 days of unprotected sexual intercourse.<sup>[1]</sup> ART involves various steps to overcome infertility, beginning with ovarian stimulation, which promotes the growth and development of multiple follicles-followed by oocyte retrieval, preparation of sperm, then oocyte insemination, embryo culture, and then embryo transfer. Apart from this, some other factors affect the sperm functioning in the conception process. In the genetic development of the embryo, sperm plays a vital role. All the genetic information transfers from one generation to another generation by the sperm's deoxyribonucleic

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This study describes the disadvantages of the centrifugation method along with the utilization of high-technology sperm separation to overcome infertility. A 31-year-old female and a 36-year-old male were presented with primary infertility in Maharashtra. The female had normal hormonal profiles; however, the male had a sperm deoxyribonucleic acid (DNA) fragmentation (SDF) index of 46%, which may be due to lifestyle factors such as occupational exposure to chemicals and alcohol use. The contribution to the rise in the SDF was previously due to conventional density gradient centrifugation. To reduce the SDF, the male was put on two months of treatment including lifestyle modification (stress reduction, diet improvement, exercise, etc.) along with the antioxidants. Following this, the sperm was separated through the LensHooke CA0 device that avoids centrifugation. This reduces oxidative stress and DNA damage using a natural motility-based sorting mechanism. Post-treatment, the SDF decreased dramatically to 17%. The couple became pregnant with IUI. This case shows that the LensHooke CA0 device effectively lowers SDF, while ART outcomes improve. These results highlight that lifestyle modification should be implemented along with modern, minimally invasive sperm separation procedures for male infertility treatment.

**KEYWORDS:** ART, DNA fragmentation, IVF, LensHooke CA0, sperm chromatin dispersion

acid (DNA); therefore, sperm DNA integrity is important.<sup>[2]</sup> DNA content impairment occurs due to various etiological factors involving multiple lifestyle factors, infection in male accessory glands, varicocele, any systemic disease, and advanced paternal age. The latest evidence shows that poor reproductive outcome increases sperm DNA fragmentation. After implantation, the genomic integrity of the embryo integrity is negatively impacted by disrupted paternal chromatin. The cause of pregnancy loss can be demonstrated by sperm DNA damage. Most of the congenital deformities

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that occur in the offspring are due to sperm DNA fragmentation.<sup>[3]</sup> Sperm separation techniques have been made including density gradient centrifugation (DGC) and the swim-up method. The density gradient technique involves the separation of sperm from semen using media of different concentrations by centrifugation. It increases the oxidative stress of sperm. It thus causes the fragmentation of the sperm which affects the outcome of assisted reproductive technology and decreases the probability of getting pregnant. A new method is required to overcome this that does not include the centrifugation process as the centrifugation causes many abnormalities that are not real and may increase the level of abnormality if present.<sup>[4]</sup> LensHooke CA0 devices came into existence to eliminate the centrifugation process and thus their negative impact on the sperms in the sperm separation method, wherein, in a microenvironment with an incorporated microporous filter membrane, we choose self-propelling spermatozoa by utilizing the natural principle of sperm motility according to the concept of self-sorting of live motile sperm.<sup>[5]</sup>

## **CASE PRESENTATION**

## **Patient information**

An infertile couple, a 31-year-old female and a 36-year-old male, visited an infertility clinic in Maharashtra and presented with a complaint of primary infertility for the past year. They were asked about their detailed history and were informed about the process, along with the advantages and disadvantages, with informed consent.

## Medical and surgical history

According to reports, the couple had no prior surgical procedures. The male had no medical history. He had worked in the chemical industry for the past 5 years and also had an addiction to alcohol. The female partner was a housewife, and this was their second visit to the infertility clinic.

## **Physical examination**

These examinations included vital signs, genital examination, body mass index (BMI)—male: 23 kg/m<sup>2</sup>, female: 22 kg/m<sup>2</sup>, and abdominal and pelvic examinations. All results were normal in both individuals.

## Investigation

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To identify the fundamental cause of their infertility, both the male and female underwent several investigations. The female patient underwent various hormonal tests, including thyroid-stimulating hormone (TSH)— 3.1 mIU/L, luteinizing hormone (LH)—10 IU/L, follicle-stimulating hormone (FSH)—11 IU/L, and anti-Müllerian hormone (AMH)—2 ng/mL. According to the reports, all the readings were within the normal range.

The male semen analysis report revealed a sperm count of 50 million/ml, with motility at 55% and 97% defects. For further assessment of the cause of infertility, a sperm chromatin dispersion (SCD) test was conducted, which showed sperm DNA fragmentation at 46%, considered abnormal.

## Treatment and follow-up

The patient was advised to take antioxidants for 2 months along with lifestyle modification including exercise, yoga and nutrition, hydration, and avoiding alcohol as shown in Table 1.

After two months, the patient returned for a semen analysis. According to the previous report of Intrauterine insemination (IUI) failure and DNA fragmentation index (DFI). The sperm separation technique might be the reason for increasing sperm DNA fragmentation. The method used previously was density gradient centrifugation (DGC) where sperm separation is

Week	Focus Area	Specific Actions
Week 1 Diet Overhaul Heat Management Exercise Start	Diet Overhaul	- Add antioxidant-rich foods (berries,
		nuts, leafy greens).
		- Reduce processed foods.
		- Add Omega-3 sources (fish, flaxseeds).
	Heat	- Avoid tight clothing and prolonged
	Management	laptop use on the lap.
	Exercise Start	- Begin with 3 moderate-intensity
	sessions (e.g., 30-minute walk, cycling).	
Week 2	Stress	- Start a daily 10-minute meditation or
Reduction Regular Ejaculation Supplementation	Reduction	deep breathing practice.
	Regular	- Aim for ejaculation every 2–3 days.
	Ejaculation	
	Supplementation	- Begin CoQ10, Vitamin E, Vitamin C,
		Zinc, and L-Carnitine (consult with a
	doctor).	
Week 3 Sleep Hygiene Exercise Increase Toxin Avoidance	- Set a sleep schedule for 7–9 hours	
		nightly.
		- Reduce screen time before bed.
	Exercise	- Increase to 4 sessions/week (include
	Increase	resistance training).
	Toxin	- Avoid alcohol and smoking
	Avoidance	completely.
Week 4 M Pr En To Pa	Monitor	- Reflect on diet, exercise, and stress
	Progress	levels.
		- Adjust habits where needed.
	Environmental	- Replace harmful chemicals in
	Toxins	household products.
		- Use protective gear if exposed to
		toxins.
	Partner Support	- Discuss shared health goals and track
		progress together.

done by using density gradient media which involves centrifugation of media along with the semen where the centrifugation causes fragmentation. So for a better outcome of the IUI (intrauterine insemination) LensHooke CAO sperm separation device was used.

## Semen analysis

The semen sample was collected by ejaculation from the patient for analysis in which sperm count, motility, and morphology were assessed to evaluate overall sperm quality. Sperm separation technique using LensHooke CA0 is shown in Figure 1, by adding semen at the base and media above the filter using a micropipette, and after incubation at 37°C for 30 minutes the media above the filter is used for the procedure.

After two months of modification in the lifestyle along with the use of LensHooke CA0 for the sperm separation, the degree of sperm DNA fragmentation was decreased to 17% and the sample was then used for IUI (intrauterine insemination) on the ovulation day of the female. After 5 to 7 days, beta-human chorionic gonadotropin ( $\beta$ -hCG) levels were positive at 1500 mIU/mL, confirming the patient's successful pregnancy.

#### DISCUSSION

Here, we evaluated the efficacy of a new centrifugation-free CA0 device for sperm separation. This technology uses the sorting of live motile sperms to minimize sperm DNA fragmentation and allow the selection of sperms with enhanced fertilization potential.<sup>[6]</sup> The perfect sperm-sorting apparatus should be simple to use and efficient. Lower sperm concentration, deficient sperm motility, and abnormal sperm morphology are the most noticeable abnormalities found in semen which can be a cause of infertility.<sup>[7]</sup> In ART, several processing techniques of semen can be used to overcome these abnormalities. Sperm separation

Figure 1: LensHooke CA0 device for sperm separation

techniques have been made including DGC and the swim-up method. Due to centrifugation, the processing increases the oxidative stress of the sperm. It thus causes the fragmentation of the sperm which affects the outcome of assisted reproductive technology and decreases the probability of getting pregnant.<sup>[8]</sup> A new method is required to overcome this that does not include the centrifugation process as the centrifugation causes many abnormalities that are not real and may increase the lee of abnormality if present.<sup>[9]</sup>

Many procedures like magnetic activated cell sorting (MACS) and LensHooke CA0 devices. LensHooke CA0 devices came into existence to eliminate the centrifugation process and thus their negative impact on the sperms in the sperm separation method, wherein, in a microenvironment with an incorporated microporous filter membrane, we choose self-propelling spermatozoa by utilizing the natural principle of sperm motility according to the concept of self-sorting of live motile sperm. Based on the plateau phase in total motility and the viability of CA0, we deduced an ideal incubation duration of 30 minutes. However, we discovered that even a brief 5-minute incubation period can produce high-quality total motility in normozoospermic samples.<sup>[5]</sup>

A sufficient quantity of high-quality motile sperm can be obtained by administering CA0 for five minutes since many non-normozoospermic patients would choose intra-cytoplasmic sperm injection (ICSI) treatment, which requires comparatively fewer spermatozoa than other insemination treatments.<sup>[10]</sup> Repeating CA0 separation with the same apparatus can readily obtain an adequate quantity of post-process spermatozoa, out of all the sperm separation methods used in clinics. According to our initial analysis (private internal data), post-selection semen quality measures are not significantly improved by the modified swim-up compared to DGC procedures. Therefore, the comparative selection performance of CA0, DGC, and Zymot was the main emphasis of this investigation.[11] IUI and in vitro fertilization IVF are better suited for centrifugation-free sperm-separating devices, particularly the CA0 method, which guarantees the lowest level of ART. In terms of improving the removal of spermatozoa with DNA damage, DGC produced erratic results indicating a drop in DFI.<sup>[5]</sup>

#### CONCLUSION

This case study underscored the significance of integrating lifestyle modifications with advanced sperm separation techniques to address male infertility. The use of the LensHooke CA0 device, a centrifugation-free sperm separation technology, effectively reduced sperm DNA



fragmentation from 46% to 17%, resulting in a successful pregnancy through intrauterine insemination (IUI). The CA0 device offers a promising alternative to conventional methods like density gradient centrifugation, as it minimizes oxidative stress and DNA damage by relying on natural motility-based sperm sorting.

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#### **Conflicts of interest**

There are no conflicts of interest.

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