Assessment of Sperm DNA Fragmentation at Multiple Processing Durations Using the Novosort Device

Danielle Henthorn M.S, Brittney Garza B.S, Anthony Anderson D.H.Sc, Amanda Hanson B.S, Sam Marple M.S

IVF Academy USA, San Antonio TX

Introduction

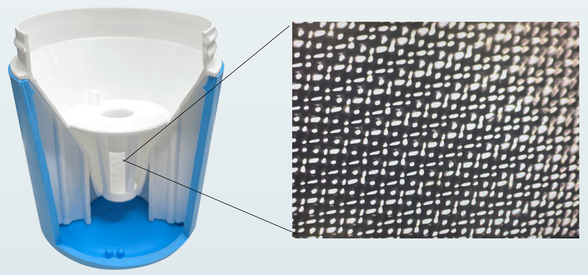
Sperm DNA fragmentation (SDF) has emerged as an important biomarker of male fertility, with elevated levels associated with reduced fertilization rates, impaired embryo development, and poorer reproductive outcomes in assisted reproductive technologies (ART). Conventional sperm preparation methods aim to improve sperm quality but can be time-consuming and technique-dependent. The NovoSort device offers a streamlined, closed-system approach to sperm selection designed to isolate motile sperm with intact DNA while maintaining chain of custody. However, limited data exist on the optimal processing duration and its impact on SDF and key semen parameters. This study aims to evaluate changes in sperm DNA fragmentation at multiple time points during NovoSort processing compared to unprocessed semen, while also assessing corresponding effects on sperm motility and concentration.

Materials & Methods

Semen samples (n=25) were collected using ProteX Collection Cups and divided into four aliquots: one unprocessed (neat) and three processed in the NovoSort device for 15, 30, and 45 minutes. These durations were selected based on NovoSort's protocol recommendations: 15 minutes for ICSI, 30 minutes for IUI, with a maximum processing time of 60 minutes. To standardize sample input, all samples were adjusted to a total semen volume of 2.0 mL with the addition of 1.0 mL of HEPES-buffered sperm wash media in the basket. Post-processing, aliquots were evaluated for sperm concentration, progressive motility, and DNA fragmentation using a sperm chromatin dispersion (SCD) assay. Samples were diluted to ⩽20 million/mL and processed according to kit instructions. While a minimum of 1 sperm cell was counted per sample, the goal was to count to 200 sperm cells per sample, although some samples had lower counts due to sample quality. Two technicians performed the counts and mean was calculated. Also ensuring that counts were within a 10%agreement. Statistical analysis was conducted using one-way ANOVA.

Results

Average SDF decreased significantly over time: from 13.8%(neat) to 2.9%(15 min), 3.0%(30 min), and 3.8%(45 min) ($p < 0.01$). Progressive motility increased from 64.2%in unprocessed semen to 93.4%, 91.6% and 87.0%at 15, 30, and 45 minutes, respectively. Sperm concentration recovered variably over time, with means of 9.31, 21.29, and 32.09 M/mL for 15, 30, and 45 minutes compared to 51.57 mil/mL in neat samples. The 15-minute point showed the greatest SDF reduction while preserving high motility and adequate yield.



Conclusion

NovoSort processing significantly reduces sperm DNA fragmentation as early as 15 minutes, with sustained benefits through 45 minutes. Early sperm processing offers an efficient method for isolating sperm with intact DNA and improved motility. Additionally, this streamlined process reduces the complexity of traditional sperm preparation methods, offering a faster and more efficient alternative in ART labs while maintaining chain of custody. Clinically meaningful reductions in sperm DNA fragmentation were achieved within 15 minutes using NovoSort processing. Rapid isolation of genetically intact motile sperm may allow for more effective sperm selection while reducing preparation complexity, while supporting integration of streamlined selection technologies into routine ART practice.

Acknowledgements

This work was supported by Reproductive Solutions.

Figure 1: Reduction in SDF across Durations

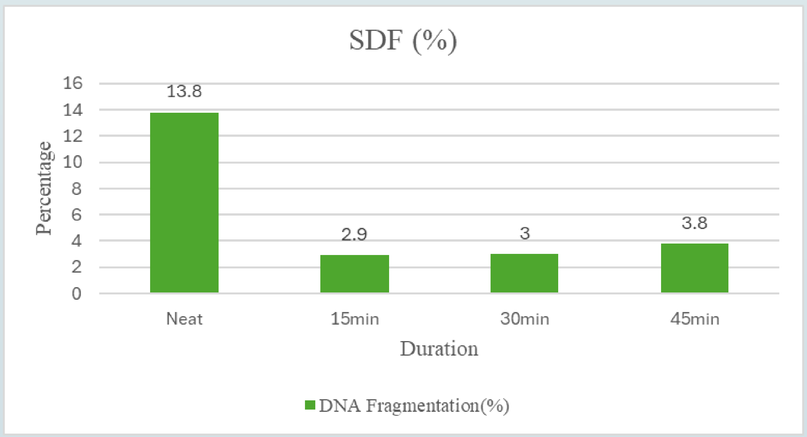


Figure 2: Evaluation of Sperm Concentration across Durations

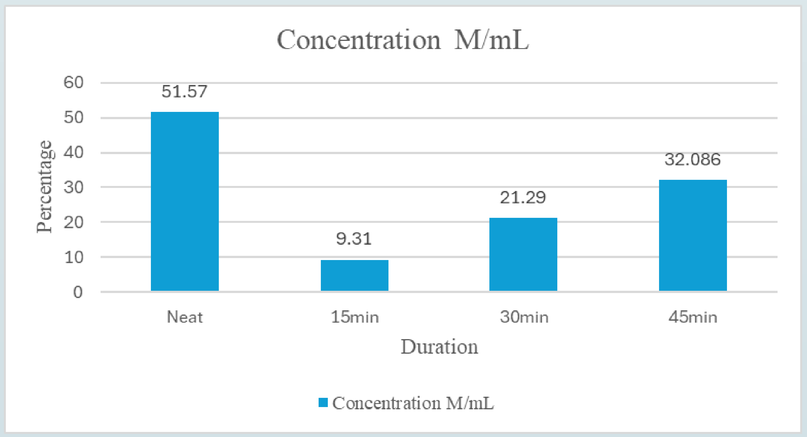


Figure 3: Evaluation of Sperm Motility across Durations