Microfluidic Sorting Selects Sperm for Clinical Use With Reduced DNA Damage Compared to Density Gradient Centrifugation in Split Semen Samples

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Capsule: Microfluidic sorting of unprocessed semen allows for the selection of clinically usable sperm with lower DNA fragmentation than standard processing.

Objective: To determine if microfluidic sorting improves the selection of sperm with lower DNA fragmentation over standard density-gradient centrifugation.

Design: Blinded, controlled laboratory study.

Setting: Academic medical center.

Specimens: Consecutively collected routine semen analysis samples (n=70).

Intervention(s): For each sample, the unprocessed semen was tested for DNA fragmentation and split for processing by density-gradient centrifugation and sorting by a microfluidic chip. DNA fragmentation was assessed in unprocessed and processed samples by Sperm Chromatin Dispersion (SCD) test.

Outcome Measure: DNA Fragmentation Index (DFI) was calculated as number of cells with fragmented DNA divided by the number of cells counted per slide.

Results: The median DFI in unprocessed samples was 21% (IQR 14-30). In paired analyses of all samples, those processed by the microfluidic chip demonstrated significantly decreased DFI compared to those processed by density-gradient centrifugation and unprocessed samples. The median DFI for chip specimens was 0% (IQR 0-2.4) while those processed by density gradient centrifugation had a median DFI of 6% (IQR 2-11). Unprocessed samples in the highest DFI quartile (DFI range 31-40%) had median DFI of 15% (IQR 11-19%) after density-gradient centrifugation and DFI 0% (IQR 0-1.9%) after processing with the microfluidic chip (p=0.02).

Conclusion: Microfluidic sorting of unprocessed semen allows for the selection of clinically usable, highly motile sperm with nearly undetectable levels of DNA fragmentation. Future studies will be expending the sample size, and validate if the use of chip can be translated into difference in pregnancy rates.

Conflict of Interest Disclosures:

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