Male Infertility Evaluation Using Oxidation-Reduction Potential and Sperm DNA Fragmentation Test

Cătălina Barbăroșie

American Center for Reproductive Medicine, Cleveland Clinic, Cleveland, OH, USA
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PhD Student
Faculty of Biology, University of Bucharest, Romania
**Introduction**

Limitations of routine semen analysis

- Poorly standardized
- Inconsistent semen parameters
- Intraindividual variability
- Missing information about sperm dysfunctions

**Advanced semen analysis (ASA)**

- Oxidation reduction potential (ORP)
- DNA fragmentation:
  - TUNEL assay
  - COMET assay
  - SCSA
  - SCD test

Sperm function

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Aim and Objectives

Aim
To evaluate the diagnostic and prognostic properties of advanced semen tests

Objectives
To determine if advanced semen tests can:
• diagnose male infertility
• play a role in predicting fertilization and pregnancy
• be advantageous over conventional semen analysis
Materials and Methods

**Systematic Literature Review**
- PubMed database
- PRISMA checklist

**Inclusion criteria:**
- Original articles

**Exclusion criteria:**
- Non-human studies
- Non-English studies
- Data prior to 8 years
- Reviews, Systematic reviews, Meta-analysis

**2 sets of Keywords**
- To analyze if CSA can diagnose male infertility and fertility outcome
- To assess the diagnostic and prognostic value of ASA
Conventional Semen Analysis

- Semen Analysis
- Semen Parameters
- WHO
- Diagnosis or Prognosis
- ART
- In Vitro Fertilization
- ICSI
Advanced Semen Analysis

- Spermatozoa
- Oxidation-Reduction
- DNA Fragmentation
- Oxidative Stress
- Diagnosis or Prognosis
- ART
- In Vitro Fertilization
- ICSI
Results: Conventional Semen Analysis

Relevant factor predicting the pregnancy outcome
(Liu et al., 2016)
Concentration is higher in controls
(Belva et al. 2016)

Routine analysis is not enough to predict natural conception
(Redmond et al., 2013; Voncina et al., 2016)

Limitation: Only 4 articles analyzed
Significant correlation between the ORP and the semen parameters (Agarwal et al., 2016)

Good predictor of poor sperm quality (Agarwal et al., 2018)

Discriminant between fertile and infertile men (Agarwal et al., 2017)

No studies have been done to assess its influence on fertility outcome

Comparison of ORP values in fertile and infertile men

p = 0.021
Comparison of SDF using SCD assay in fertile and infertile men

**SCD assay**

- Higher embryo quality in those with low SDF (Kim et al., 2019)
- Not associated with fertilization or pregnancy outcomes (Sun et al., 2018)
- The comparison of groups from all studies was not insignificant (Ribas-Maynou et al., 2013; Zandieh et al., 2018)
Results – Sperm DNA Fragmentation

SCSA

- Predicts pregnancy outcomes (Venkatesh et al., 2011)
- Can not predict pregnancy (Ribas-Maynou et al., 2013)
- Can predict live-birth rate (Xue, Wang et al. 2016)
- More studies are needed

Comparison of SDF using SCSA in fertile and infertile men

p = 0.085
Results – Sperm DNA Fragmentation

**COMET**

- Alkaline Assay – can diagnose male infertility (Simon et al., 2011)

- Alkaline Assay – predicts fertility outcome in IVF pregnancies (Simon et al., 2011)

- Neutral Assay - does not distinguish between fertile and infertile men (Ribas-Maynou et al., 2013)

Comparison of SDF using COMET assay in fertile and infertile men
TUNEL

- Can distinguish between fertile and infertile men (Ribas-Maynou et al., 2014)
- Correlated with the RPL, blastulation and pregnancy outcomes (Bareh et al., 2016)
- Can predict natural conception (Bareh et al., 2016)
- The predictive value is low (Garolla et al., 2015)

Comparison of SDF using TUNEL assay in fertile and infertile men

\[ p = 0.021 \]
Conclusions

**ORP**

- Limitations
  - More studies - fertilizing capacity and pregnancy outcomes

- Strengths
  - Standard value
  - Supplementary test or diagnostic tool
  - Cost-effective
  - Reliable and reproducible measure of sperm quality

**DNA Fragmentation**

- Limitations
  - Management of patients with an adverse result
  - Missing clinical references values

- Strengths
  - Related to sperm quality, embryo development and pregnancy loss
  - DFI level - valuable parameter in the treatment of repeated pregnancy loss
  - No consensus on the best testing procedures
Thank You Very Much For Your Attention!