Clinical value of the newly developed nomogram predicting the fertilization outcome in assisted reproductive technology (ART)

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Objective
- To develop the clinically useful nomogram which can predict the fertilization outcome of IVF and ICSI based on semen parameters and women factors.

Materials and Methods
- To identify the predictive factors of successful fertilization, IVF and ICSI cycles in our clinic were analyzed.
- All semen was analyzed by new computer aided sperm analysis (CASA) system named sperm motility analysis system (SMAS) before and after sperm separation using Percoll solution.
- Women factors including age, serum AMH levels and the number of eggs retrieved were also included in the analysis.

<table>
<thead>
<tr>
<th>Factors measured</th>
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<tbody>
<tr>
<td>VCL: Sperm Line Velocity</td>
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<td>VAP: Average Path Velocity</td>
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<td>ALH: Amplitude of lateral head displacement</td>
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<td>BCF: Beat-cass-frequency</td>
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</tbody>
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Factors calculated:
- Uni: Linearity = VSL/VCL
- STR: Straightness = VSL/VAP
- SMV: Sperm Motility Value
  - VSL x (2.7xTaqioid moite sperm cell + 0.3)xperm concentration

Methods
- Univariate analysis was conducted to assess the association of several factors with the fertilization outcome.
- Significant factors based on univariate analysis were included in the multiple linear regression analysis (forward elimination if F=2.0).
- ROC curve analysis was used for cutoff value prediction.

Result
- A total of 899 IVF cycles were evaluated to identify predictive factors.
- Univariate analysis was conducted to assess the association of several factors with the fertilization outcome.
- Significant factors based on univariate analysis were included in multiple regression analysis.
- ROC curve analysis was used for cutoff value prediction.

Significant factors based on univariate analysis

<table>
<thead>
<tr>
<th>Factors</th>
<th>Univariate analysis</th>
<th>R²</th>
<th>Chi-square test</th>
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<tbody>
<tr>
<td>Male age (&gt;36)</td>
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<tr>
<td>Male factors</td>
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<tr>
<td>Rapid sperm concentration</td>
<td>R&lt;0.3</td>
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<td>P&lt;0.05</td>
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<tr>
<td>Log number of eggs retrieved</td>
<td>R&lt;0.3</td>
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<td>P&lt;0.05</td>
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<td>Male factors</td>
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</table>

Nomogram = 44.65 – 15.56*log(eggs) + 16.23*logSMV + 4.34*VCL + 5.0*FLH

P<0.001 (Pearson’s correlation coefficient test)

Conclusions
- IVF fertilization nomogram determined by semen analysis parameters and number of eggs retrieved was able to predict the fertilization in IVF.
- On the other hand, there was no independent predictive factor predicting fertilization outcome in ICSI.

Nomogram is useful to predict the fertilization outcome in IVF

There was no independent factor predicting the fertility outcome of ICSI

Fertilization outcome of ICSI is independent of semen characteristics